

**PURCTM****Radio Paging Stations**
Control and Application

MUST BE USED WITH
Associated Station Manual

Instruction Manual

68P81060E70-A

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EPS-27734-O

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EPS-34440-A



GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A PURC Radio Paging Stations
Control and Applications

REVISION DETAILS:

1. The procedure to set maximum deviation is changed.
Replace paragraph 2.2 in Jumper Options and Transit Audio Level Setting section 68P81062E31-0 with the procedure given below.

2.2 Set Maximum Deviation

2.2.1 Without TRN5347A Voice
Actuated Response Module (VAR)

Step 1. (pre-emphasized audio only)
Set modulation as in paragraph 2.1,
and adjust exciter IDC control for
 ± 5 kHz total deviation.

Step 2. (flat audio only) Set
modulation as in paragraph 2.1.
adjust flat audio IDC control fully
clockwise. Adjust exciter IDC
control for ± 5 kHz total deviation.

2.2.2 With (VAR), the following procedure applies:

PURC TRANSMIT AUDIO LEVEL ADJUSTMENT

Step 1. Set VAR DISABLE switch on VAR to DISABLE position.

Step 2. Turn R43 fully clockwise on VAR, for maximum output.

Step 3. Turn R28 fully clockwise on TRN5348A Flat Audio Board to set minimum resistance.

Step 4. Set PRE-EMP/FLAT switch on VAR to FLAT position.

Step 5. Apply a 1 V rms, 1 kHz tone to TRN4859A Line Driver XCTR LEVEL jack.

Step 6. Adjust exciter IDC control for ± 5 kHz peak deviation.

Step 7. Adjust input level of 1 kHz tone for ± 3 kHz deviation.

Step 8. Set PRE-EMP/FLAT switch on VAR to PRE-EMP position.

Step 9. Adjust R43 on VAR for ± 3 kHz deviation.

Step 10. Apply a 1 kHz test tone (from phone line) to TRN4859A Line Driver XMTR LINE input, and adjust R39 on line driver for ± 3 kHz deviation.

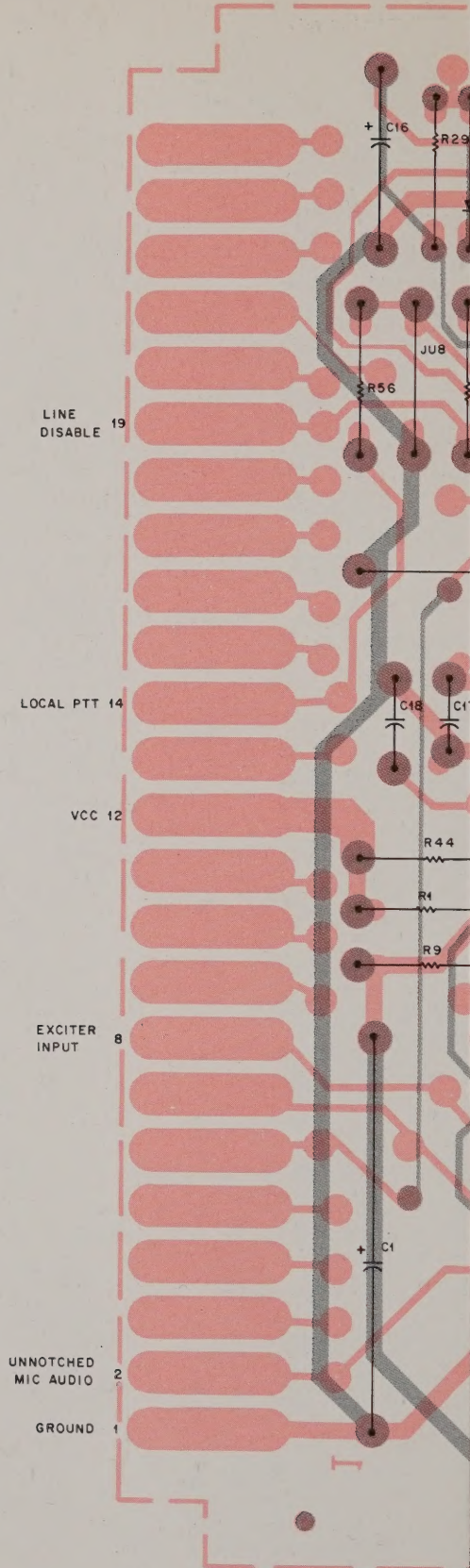
Step 11. Set VAR DISABLE switch to ENABLED position (opposite DISABLE position).

2. Information for TRN5347A Voice Actuated Response Module is added to the instruction manual listed above.

3. ATTACHMENT

TRN5347A Voice Actuated Response
Module Schematic Diagram and Main

Circuit Board Detail.....68P81048E69-0



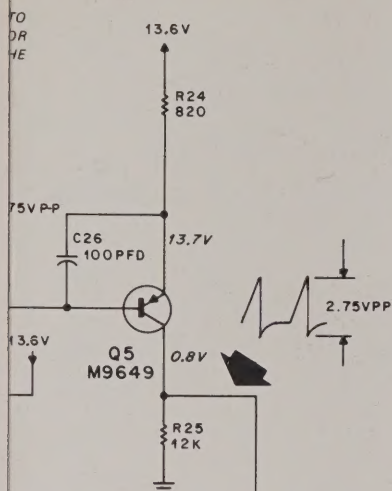
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NOTE:

1. R53 MOUNTED ON SOLDER SIDE.
2. S1 AND S2 MOUNTED ON FRONT PANEL.

VOICE ACTUATED RESPONSE MODULE

MODEL TRN5347A



FUNCTION

The Voice Actuated Response Module (VAR) monitors the type of audio that is present at the Unnotched Mic Audio (pin 2). If tones are present, the VAR routes this audio to the buffer which has a constant gain throughout the audio frequency range. If voice is present, the VAR provides EIA 6 db per octave pre-emphasized audio response.

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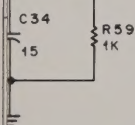
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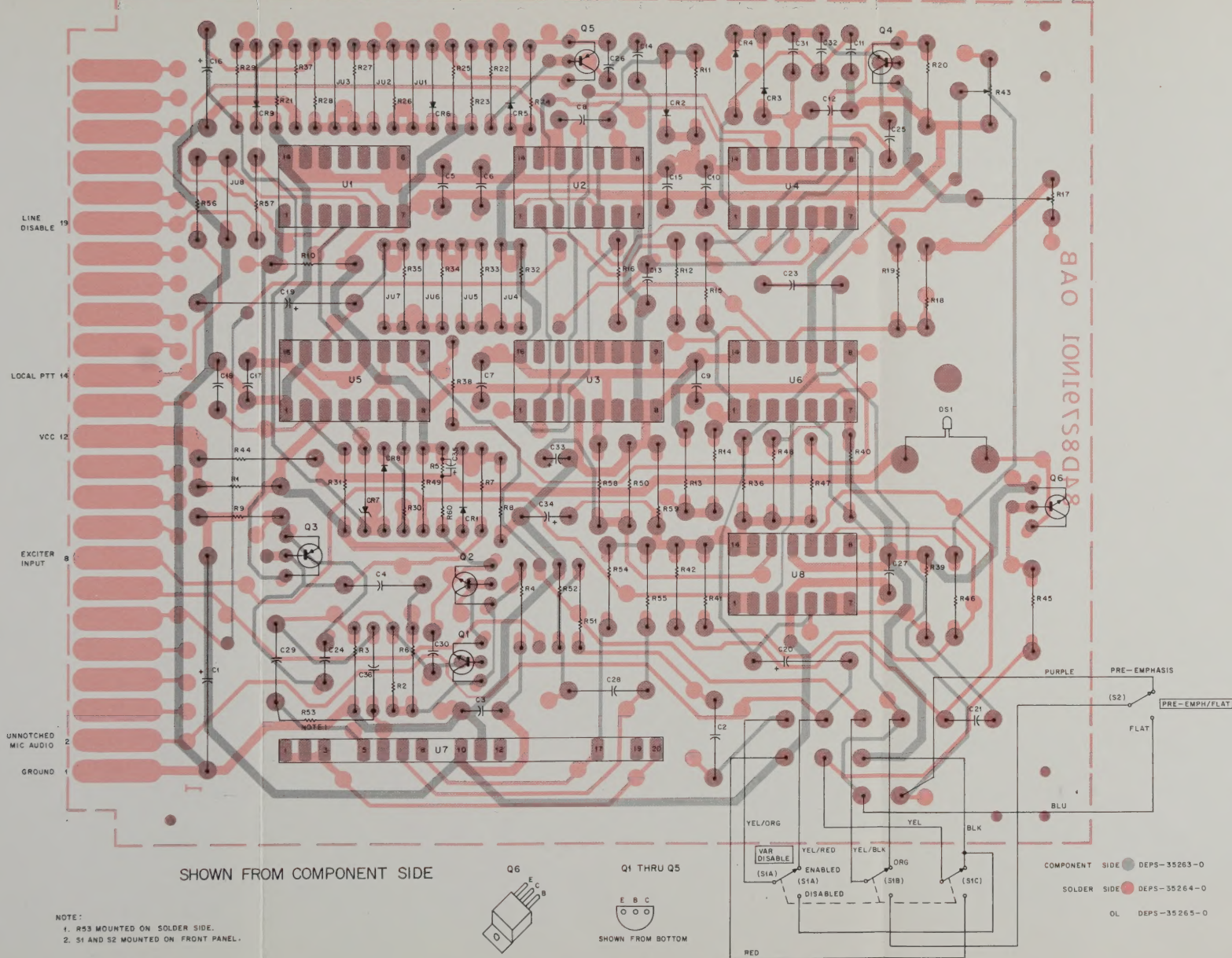
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8 EXCITER
INPUT

FOLLOWER

6.8V
SOURCE





parts list

TRN5347A Voice Actuated Response Module

PL-8209-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	23-84669A19	capacitor, fixed: uF ± 10%; 50 V; unless otherwise stated
C2	8-82905G11	100 uF + 150-10%; 20 V
C3	8-11017B08	.01
C4	8-82905G11	.02
C5, 6, 7	8-11017B08	.01
C8	21-82187B20	.001 uF ± 10%; 100 V
C9, 10	8-11017B08	.01
C11, 12	8-11017A08	.01 uF ± 5%; 50 V
C13	8-11017A17	0.1 uF ± 5%; 50 V
C14, 15	8-11017B08	.01
C16	23-82783B08	1.0 uF ± 20%; 35 V
C17	8-11017B08	.01
C18	21-82187B20	.001 uF ± 10%; 100 V
C19	23-83214C15	4.7 uF ± 20%; 25 V
C20	23-84762H08	3.0 uF ± 20%; 15 V
C21	21-82537B38	.001 uF ± 3%; 100 V
C22	NOT USED	
C23	8-82905G11	.02
C24, 25, 26	21-11014H49	100 pF ± 5%; 100 V
C27	8-11017B08	.01
C28, 29	8-82905G11	.02
C30, 31, 32	21-11014H49	100 pF ± 5%; 100 V
C33	23-84538G01	1.0 uF ± 20%; 35 V
C34	23-84538G04	15 uF ± 20%; 20 V
C35	23-84538G06	47 uF ± 20%; 20 V
C36	21-11014H49	100 pF ± 5%; 100 V
CR1	48-83654H02	diode: (see note)
CR2, 3, 4	48-83654H01	silicon
CR5	48-83654H02	silicon
CR6, 8, 9	48-83654H01	silicon
DS1	65-83554G01	lamp, incandescent: 12 V
Q1, 2	48-869642	transistor: (see note)
Q3	48-869649	NPN; type M9642
Q4	48-869706	PNP; type M9649
Q5	48-869649	PNP; type M9649
Q6	48-869640	NPN; type M9640
R1	6-11009C01	resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R2	6-11009D18	10
R3	6-11009D14	680k
R4	6-11009C59	470k
R5	6-11009C35	2.7k
R6	6-11009C61	270
R7	6-11009C75	3.3k
R8	6-11009C79	12k
R9	6-11009C45	18k
R10	6-11009C83	680
R11	6-11009C97	27k
R12	6-11009C49	100k
R13	6-11009C85	1k
R14	6-11009C93	4.7k
R15, 16	6-11009C49	68k
R17	18-84944C03	1k
R18	6-11009C93	variable; 10k
R19	6-11009C49	68k
R20	6-11009C51	1k
R21	6-11009D04	1.2k
R22	6-11009C75	18k
R23	6-11009C79	12k
R24	6-11009C47	18k
R25	6-11009C75	820
R26	6-11009C71	12k
R27	6-11009C59	2.7k
R28	6-11009C63	3.9k
R29	6-11009D14	470k
R30	6-11009C25	100
R31	6-11009C97	100k
R32	6-11009C73	10k
R33	6-11009C85	33k
R34	6-11009C91	56k
R35, 36, 37	6-11009C97	100k
R38	6-11009C73	10k
R39	6-11009C49	1k
R40	6-11009C97	100k
R41	6-11009C67	5.6k
R42	6-11009C73	10k
R43	18-83083G16	variable; 25k
R44	6-125A01	10; 1/2 W
R45	6-11009C61	3.3k
R46, 47, 48	6-11009C97	100k
R49	6-11009C49	1k
R50	6-11009C97	100k
R51, 52	6-11009C75	12k
R53	6-11009C99	120k
R54 thru 58	6-11009C97	100k
R59	6-11009C49	1k
R60	6-11009C15	39

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
S1	40-83204B03	switch: dpdt
S2	40-83204B01	dpdt
U1	51-82884L66	integrated circuit: (see note)
U2	51-82884L05	quad 2-input nand Schmitt
U3	51-82884L10	quad 2-input nand gate
U4	51-82884L14	dual 1-k flip-flop
U5	51-82884L53	quad analog switch
U6	51-82884L14	dual precision monostable
U7	1-80777D13	quad analog switch
U8	51-82609M05	hybrid notch filter
VR1	48-82256C12	quad op-amp
voltage regulator: (see note)		
Zener type		
mechanical parts		
3-125790	SCREW, machine: 4-40 x 5/16"; 2 used	
45-83914G01	GUIDE CARD; 2 used	
46-84703E01	GUIDE CARD; circuit board	
61-855798	JEWEL, GRN	
9-84285C01	SOCKET, wedge base	
29-8187C01	TERMINAL, strain relief; 11 used	
9-83697M01	RECEPTACLE, female; 24 used	
43-865080	BUSHING; 2 used	
28-83918F01	CONNECTOR; 13 used	
64-83163L17	PANEL	

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

VOICE ACTUATED RESPONSE MODULE

MODEL TRN5347A

NOTES:

- Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads, and inductor values are in millihenries.
- Unless otherwise indicated: all waveforms have an amplitude of 13.5 V. All waveforms are taken with a 1 kHz sine wave (340 mV p-p) applied to pin 2 of module.
- Adjust R17 until the waveform shown on this diagram appears on the positive side of C13.
- Switch S1 shown in enabled position. Switch S2 shown in pre-emphasis position.
- Normal jumper settings are shown below:

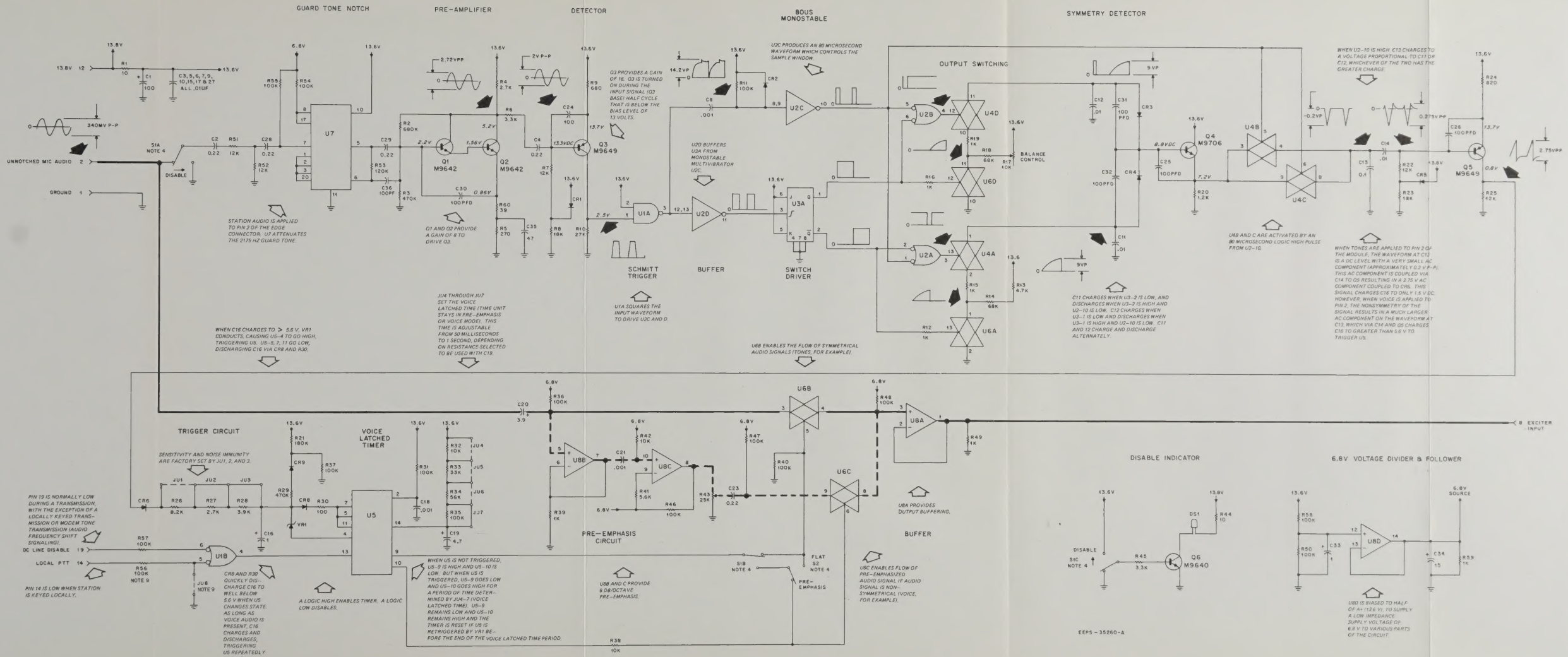
Voice Latched Timer Jumpers				
Time	JU4	JU5	JU6	JU7
1 sec	OUT	OUT	OUT	OUT
950 ms	IN	OUT	OUT	OUT
850 ms	OUT	IN	OUT	OUT
800 ms	IN	OUT	OUT	OUT
750 ms	OUT	IN	OUT	OUT
700 ms	OUT	IN	OUT	OUT
650 ms	OUT	IN	OUT	OUT
600 ms	OUT	IN	OUT	OUT
550 ms	IN	IN	IN	OUT
500 ms	OUT	IN	OUT	IN
450 ms	OUT	OUT	OUT	IN
400 ms	OUT	IN	OUT	IN
350 ms	OUT	IN	OUT	IN
300 ms	IN	IN	IN	IN
250 ms	OUT	OUT	IN	IN
200 ms	OUT	IN	IN	IN
150 ms	IN	OUT	IN	IN
100 ms	OUT	IN	IN	IN
50 ms	OUT	IN	IN	IN

Jumper JU8 is usually IN, it is OUT for link transmitters.
Jumpers JU1-JU3 are usually inserted or removed at the factory to provide the proper sensitivity and noise immunity. Normally JU1 is OUT and JU2, JU3 are IN.

- This diagram shows positive logic:
Logic "1" greater than 11 V DC
Logic "0" less than 4 V DC
- Integrated circuits on this board are CMOS devices.
- IC types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Description
U1	84L86	14	7	Quad 2-input NAND Schmitt Trigger
U2	84L05	14	7	Quad 2-input NAND Gate
U3	84L10	16	8	Quad J-K Flip-Flop
U4, U5	84L14	14	7	Quad Analog Switch/Quad Multiplexer
U5	84L53	16	8	Retriggerable/Resettable Monostable Multivibrator
U7	17D13	10	11	Hybrid Notch Filter (Attenuates 2175 Hz)
U8	08M05	4	11	Quad Operational Amplifier

- For caging base station applications, jumper JU8 must be IN and resistor R56 (100k) must be cut out. For link transmitter applications, jumper JU8 must be cut out and resistor R56 must be left in.



FUNCTION

The Voice Actuated Response Module (VAR) monitors the type of audio that is present at the Unnotched Mic Audio (pin 2). If tones are present, the VAR routes this audio to the buffer which has a constant gain throughout the audio frequency range. If voice is present, the VAR provides E1A 6 db per octave pre-emphasized audio response.

instruction manual revision

GENERAL

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INSTRUCTION MANUAL AFFECTED:

68P81060E70-A PURC Radio Paging Stations Control and Application

MODELS AFFECTED:

PURC TRANSMITTER

C64JZB Series
C71JZB Series
C73JZB Series
C75JZB Series
C84JZB Series

LINK TRANSMITTER

C35JZB Series
Q2628A
Q2629A
Q2630A
Q2631A

REVISION DETAILS:

The following wire connections and jumpers are added to TRN4860A Unified Remote Control Board.

Wire additions on all models:

<u>COLOR</u>	<u>FROM MODULE-PIN</u>	<u>TO MODULE-PIN</u>	<u>FUNCTION</u>
BLU	4-16	2-7	KEYED A-
YEL	9-21	J4-9	INTERCOM HI
WHT	10-19	9-19	DC LINE DISABLE
WHT	9-19	6-13	DC LINE DISABLE
YEL/BRN	10-14	11-13	LOCAL PTT
RED/YEL	9-10	12-10	9.6 V DC

Jumper additions:

<u>JUMPER</u>	<u>COLOR</u>	<u>FROM</u> <u>MODULE-PIN</u>	<u>TO</u> <u>MODULE-PIN</u>	PURC MODELS WITH <u>SCM</u>	PURC MODELS WITHOUT <u>SCM</u>	WITH <u>TOT</u>	LINK <u>MODELS</u>
JU8	WHT	J4-1	J100-10	IN	IN	IN	IN
JU9	VIO/WHT	12-5	12-8	OUT	OUT	IN	OUT
JU10	VIO	12-5	9-24	OUT	OUT	OUT	IN
JU11	ORG/WHT	12-6	11-14	OUT	OUT	IN	OUT
JU12	ORG	12-6	11-24	OUT	OUT	OUT	IN
JU13	GRN	12-2	4-8	OUT	OUT	OUT	OUT
JU14	WHT/GRN	12-2	12-1	OUT	OUT	OUT	IN
JU15	BRN	2-17	6-18	OUT	IN	OUT	OUT
JU16	WHT/BLK	5-13	6-13	OUT	OUT	OUT	IN



instruction manual revision

GENERAL

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INSTRUCTION MANUAL AFFECTED:

68P81060E70-A *PURC* Radio Paging Stations

REVISION DETAILS:

The TLN2559A Simulcast Control Module is a new unit that has been added to the *PURC* station. Add the attached information to your *PURC* manual immediately following the PAGING SYNTHESIZER section 68P81062E72.



MOTOROLA INC.

Communications
Sector

TLN2559A PURC SIMULCAST CONTROL MODULE

1. GENERAL DESCRIPTION

1.1 The TLN2559A Simulcast Control Module (SCM) is a plug-in unit for the remote control chassis of a Micor PURC Paging Station. It consists of two circuit boards, TRN5379A Control Board and TRN5603A Logic Board, fixed together to form the module. The SCM replaces the Function Tone Decoder in the PURC station, providing the keying function to the Paging Transmitter in response to one of three input signals - (a) Push-To-Talk (PTT) Control, (b) Local PTT; and (c) Line PTT. Key-up output signals are provided on the F1 Oscillator Ground and PL disable lines.

1.2 The TRN5379A Control board has the interface circuitry required to connect the microcomputer on the TRN5603A Logic Board to the base station and an on-board power supply to run the Logic Board.

1.3 The TRN5603A Logic Board contains the MC6803 microcomputer, program ROM, code selector switches, and the support devices for the microcomputer.

2. OPERATION

2.1 The basic function of the SCM is to decode Function Tone (FT) inputs and key the transmitter in response to correct codes. The three key-up request lines on the SCM have different levels of priority. PTT Control and Line PTT are immediate-response inputs with lower priority than Line PTT. Line PTT initiates the computer examination of the FT input line. The FT input goes through waveshaping circuitry and is then applied to the computer. The computer compares the FT input sequence to the code set in the selector switches to determine if the transmitter should be keyed up or not. The Group and Function Tone selection is done according to the following tables:

Group Selection

Group	G2	G3
1	on	on
2	on	off
3	off	on
0	off	off

Note: Station cannot be disabled when Group 0 is selected.

Function Tone Selection

Tone Switch (S1)	Tone Frequency (Hz)
T10	750
T9	950
T8	1050
T7	1150
T6	1250
T5	1350
T4	1450
T3	1550
T2	1650
T1	1750

KT1, end-of-sequence indicator tone, is 1950 Hz.

2.2 The SCM provides the Delayed Keyed A+ signal to the PURC station in response to a Keyed A+ input signal. The Delayed Keyed A+ stays active for about 180 ms after the Keyed A+ signal drops out. This delay allows the station to have an active A+ signal during temporary losses of Keyed A+ that can occur during mode changeover sequencing. Delayed Keyed A+ also keeps the SCM active during these short periods.

2.3 A Line PTT input signal causes the SCM to generate DC Line Disable and FT Window Control signals. DC Line Disable causes the Guard Tone Module to hold Line PTT active. If the function tone sequence stops before the SCM detects KT1, the FT Window control will time out and DC Line Disable will also become inactive about 60 milliseconds after tone input stops. If the computer detects too many function tones the DC Line Disable is dropped. In either case the latest tones are wiped from memory and the SCM returns to input line scanning. In normal operation the FT Window Control closes and DC Line Disable drops after the SCM detects KT1.

PURC SIMULCAST CONTROL MODULE

technical writing services

2.4 The F1 Oscillator Ground and PL Enable outputs become active after all conditions have been met. Since F1 Oscillator Ground is the final transmitter key-up control, any condition that would inhibit the transmitter will cause this signal to become inactive.

3. CIRCUIT DESCRIPTION

3.1 INPUT CIRCUITS

3.1.1 PTT Key-Up Lines

The PTT inputs are normally high and go low when active. The 12 volt input is converted to a logic-compatible 5 volts by input buffer U14. The buffer's outputs then go directly to the input port of microcomputer U1.

3.1.2 Keyed A +

The Keyed A + signal is applied to transistor Q8. Q8 charges C13 and causes Q9 to saturate. Q10 is normally on at this time, but has no effect. When the Keyed A + signal goes low Q8 shuts off and C13 begins to discharge through the network of R19-R20-R21-R22-R25, keeping Q10 shut off. After the discharge time period set by C13 and the resistor network, Q10 conducts, shutting off Q9. Delayed Keyed A + then goes low.

3.1.3 Function Tone Input

Sine wave tones from the audio line come into lower and upper peak detectors U10A and U10B, respectively. The peak levels are applied to opposite ends of divider network R26-R27-R28. Transmission gate U11 shifts the reference of comparator U10D to either the high-level or low-level reference point of the divider string. Since the circuit is wired in a hysteresis configuration, U11 selects the high-level reference if the input signal is below the reference point, and vice-versa. The output of U10D is a clean square wave signal which is passed through Q11, and then to the computer.

3.2 OUTPUT CIRCUITS

DC Line Disable, FT Window Control, and F1 Oscillator Ground are all transistor outputs driven directly from U1. PL Enable is driven by F1 Oscillator Ground through CR4, which allows PL Enable to be pulled low by another signal in the station without affecting F1 Oscillator Ground.

3.3 MICROCOMPUTER LOGIC

The central logic unit of the SCM is composed of microcomputer U1, octal latch U2, hex buffers U4 and U5 (with associated switch set S1), and address decoders U6 and U7. Timers U8 and U9 perform a watchdog function, keeping track of the computer's timing marks.

3.3.1 Microprocessor

U1 contains the master clock and timing generator, microprocessor, and 128 8-bit bytes of RAM. The processor communicates with the other circuitry of the SCM via four ports. Port 1 (pins 6-10) accepts the conditioned signals from the FT line and services the watchdog circuitry. Diodes CR9 and CR10 set the processor mode as "Extended Multiplexed." Port 2 (pins 13-19) handles all the input/output control signals. Port 3 (pins 22-29) provides the upper eight bits of the address bus. Port 4 (pins 30-37) provides the lower eight bits of address (through octal latch U2) and carries data from the data bus.

3.3.2 ROM

U3 contains the program information the processor needs to detect and process function tones. Address selection is done on pins 1-8, 19, 22, and 23. Data is brought out on pins 9-11 and 13-17.

3.3.3 FT Code Programming Circuit

FT codes are determined in switch set F1. The processor requests code information on address lines A14 and A15. The address decoder composed of U6 and U7 then allows the appropriate buffer to output switch code information to the data bus. The device to output data to the data bus is selected according to the following table:

Device	A14	A15
ROM	1	1
U4	1	0
U5	0	1
not used	0	0

3.3.4 Watchdog Circuit

In normal operation, U1 generates a "tickle pulse" on the P22 line (pin 10) every 66 milliseconds. A time window is established by monostables U8A and U9 during which the tickle pulse must occur. The incoming tickle pulse triggers both monostables. U9 times out before the next tickle pulse while U8A is continuously triggered. If the tickle pulses are too far apart, U8A times out. The Q output of U8A then triggers U8B, the reset pulse generator. If the tickle pulses occur too close together, U9 is still active when the next tickle pulse occurs and gate U6B clears U8A, again triggering the reset pulse generator. When U8B is triggered, the reset signal passes through Q13 and is sent to the reset pin of U1. The Q12-R44-C27 network allows the processor to generate a tickle pulse within about 6 milliseconds after the falling edge of the reset pulse. If U1 does not generate a tickle pulse in this period, U8B sends another reset pulse out. If the tickle pulse occurs normally, U8A is triggered and U8B is shut off.

4. TROUBLESHOOTING

4.1 EQUIPMENT REQUIRED

- DC - 15 MHz Dual-Trace Oscilloscope
- Audio Oscillator
- 15 MHz Frequency Counter
- Voltmeter
- TLN8799A Servicing Board Kit

4.2 FUNCTIONAL TESTS

To service the SCM it will be necessary to first unplug the module, plug in the TLN8799A extension, and then plug the SCM into the extender board. The steel cover can be removed from the TRN5603A Logic Board to gain access to the microcomputer logic assembly.

4.2.1 Power Supply

Measure the voltage on Control Board pin 12 (A +), pin 10 (9.5 V), and U13 pin 3 (5 V). Correct any problems.

4.2.2 Delayed A +

Connect one oscilloscope channel to the Keyed A + line at pin 24 of the Control Board. Connect the other channel to the Delayed Keyed A + line at pin 8. Set the oscilloscope to trigger on a low-going transition occurring on Keyed A +. Apply 12 V to Keyed A + by using the local PTT switch or a test switch. Release the PTT switch and observe the oscilloscope second channel trace. The trace should show a high-level signal which drops to ground after about 150 milliseconds. If the trace drops immediately, check the timing network for Q10 to determine if there is a component failure. If the trace stays high, check Q9 and Q10.

4.2.5 Control Outputs

The SCM output circuits are simple transistor drivers. Note that PL Enable and F1 Oscillator Ground are returned to a connection in the paging station, not to the SCM ground return. Make all measurements of these leads referenced to the Transmitter Ground, pin 11.

4.2.3 Input Buffer

The input buffer is a non-inverting shifter. 12 V input signals should come out as 5 V level signals. Check all inputs and their corresponding outputs for correct levels. Replace U14 to correct any problems.

4.2.4 Function Tone Conditioning Circuit

Connect the audio oscillator to pin 11 (FT HI) of the Control board through a .01 uF capacitor. Set the frequency to 1 kHz and the amplitude to 6 V p-p. Probe the collector of Q11 (line P20) with the oscilloscope to see a 0-5 V 1 kHz square wave signal. Reduce the generator output to .6 V p-p. The P20 signal remains the same. Measure the DC level of FT HI with no audio signal applied. Apply signal and observe U11 pin 14 (comparator reference point) with the oscilloscope. The DC level at this point is the same as that of FT HI, but with a square wave of about 10% of the audio signal level applied to FT HI. Vary the audio signal amplitude and observe the square wave signal amplitude change. If the comparator reference does not show this hysteresis effect, check peak detectors U10A and U10B and their associated components, and transmission gate U11.

SCM/STATION JUMPERS (refer to Station Module Jumper Charts)

Non-Unified Main Board TRN5349A (Low Band and VHF 330 Watt Stations)	w/board part no. 84-84212N01	- remove JU15
	w/board part no. 84-83601N01	- remove JU15 - jumper Option Slot pin 10 to SCM pin 10 - jumper Guard Tone Decoder pin 13 to SCM pin 19
Unified Main Board TRN4860A (Low Band through 960 MHz Low Power and UHF High Power)		- jumper Option Slot pin 10 to SCM pin 10 - jumper Guard Tone Decoder pin 13 to SCM pin 19 - remove CR13 - remove JU8
TSI Module TRN4853A Station control Module TRN4854B		
Station Control Module TRN4854A	Unified Chassis TRN4854B	- remove Q12
Digital Modulator Module TRN4856A,B		- remove module
F1 Module TLN5293A w/optional Link Receiver		- remove C23 and C32

MULCAST CONTROL MODULE

CIRCUIT BOARD DETAIL TRN5379A CONTROL BOARD

parts list

TRN5379A Control Board

PL-8320-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed:		
C1, 2, 3	21-11015B13	.001 uF \pm 10%; 100 V
C6	23-84538G06	47 uF \pm 20%; 20 V
C7, 8, 9	21-11015A05	.0047 uF + 80 - 20%; 100 V
C11	21-11015A07	.01 uF + 80 - 20%; 100 V
C12	21-82187B04	270 pF \pm 10%; 500 V
C13	23-82783B24	15 uF \pm 10%; 25 V
C14	21-82610C58	100 pF \pm 10%; 100 V
C15, 16	23-11019A09	1.0 uF \pm 20%; 50 V
C17, 18	21-82610C58	100 pF \pm 10%; 100 V
C19	21-11015B13	.001 uF \pm 10%; 100 V
C20	21-82187B04	270 pF \pm 10%; 500 V
C32	23-84538G06	47 uF \pm 20%; 20 V
C34	21-11015A07	.01 uF + 80 - 20%; 100 V
C38 thru 41	21-11015B13	.001 uF \pm 10%; 100 V
C42, 43, 44	21-83406D81	20 pF \pm 5%; 500 V
diode: (see note)		
CR4	48-82392B03	silicon
CR5, 6	48-83654H01	silicon
CR7, 8	48-84616A01	Hot carrier
transistor: (see note)		
Q5, 6	48-869642	NPN; type M9642
Q7	48-869567	NPN; type M9567
Q8	48-869642	NPN; type M9642
Q9	48-869328	PNP; type M9328
Q10	48-869643	PNP; type M9643
Q11	48-869642	NPN; type M9642
resistor, fixed; \pm 5%; 1/4 W; unless otherwise stated		
R1, 2, 3, 4	6-11009E65	4.7k
R5, 6	6-11009E73	10k
R9, 10, 11	6-11009E97	100k
R15	6-11009E61	3.3k
R16	6-11009E79	18k
R17	6-11009E65	4.7k
R18	6-11009E73	10k
R19	6-11009E53	1.5k
R20	6-11009E79	18k
R21	6-11009E49	1k
R22	6-11009E45	680
R23	6-11009E75	12k
R24	6-11009E73	10k
R25	6-11009E53	1.5k
R26	6-11009E63	3.9k
R27	6-11009E47	820
R28	6-11009E63	3.9k
R29	6-11009E57	2.2k
R30	6-11009F22	1 meg.
R31, 32	6-11009E87	99k
R33	6-11009E93	68k
R72	6-11009E61	3.3k
R73	6-11009E79	18k
R74	6-11009E61	3.3k
R75	6-11009E79	18k
R76	6-11009E97	100k
integrated circuit: (see note)		
U10	51-83629M09	Quad Low Power Operational Amplifier
U11	51-84887K60	Analog Multiplexer
U13	51-84561L76	Voltage Regulator (1.5A)
U14	51-82764K29	Hex Buffer
mechanical parts		
	2-132616	NUT, 6-32 x 1/4 x 3/32 x 1/8"
	3-136194	SCREW, machine: 6-32 x 3/8"
	7-84560N01	BRACKET, heat sink mounting
	26-84434N01	SHIELD

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

68P81063E72-O

(Sheet 1 of 3)

12/17/82 - V & G

SIMULCAST CONTROL MODULE

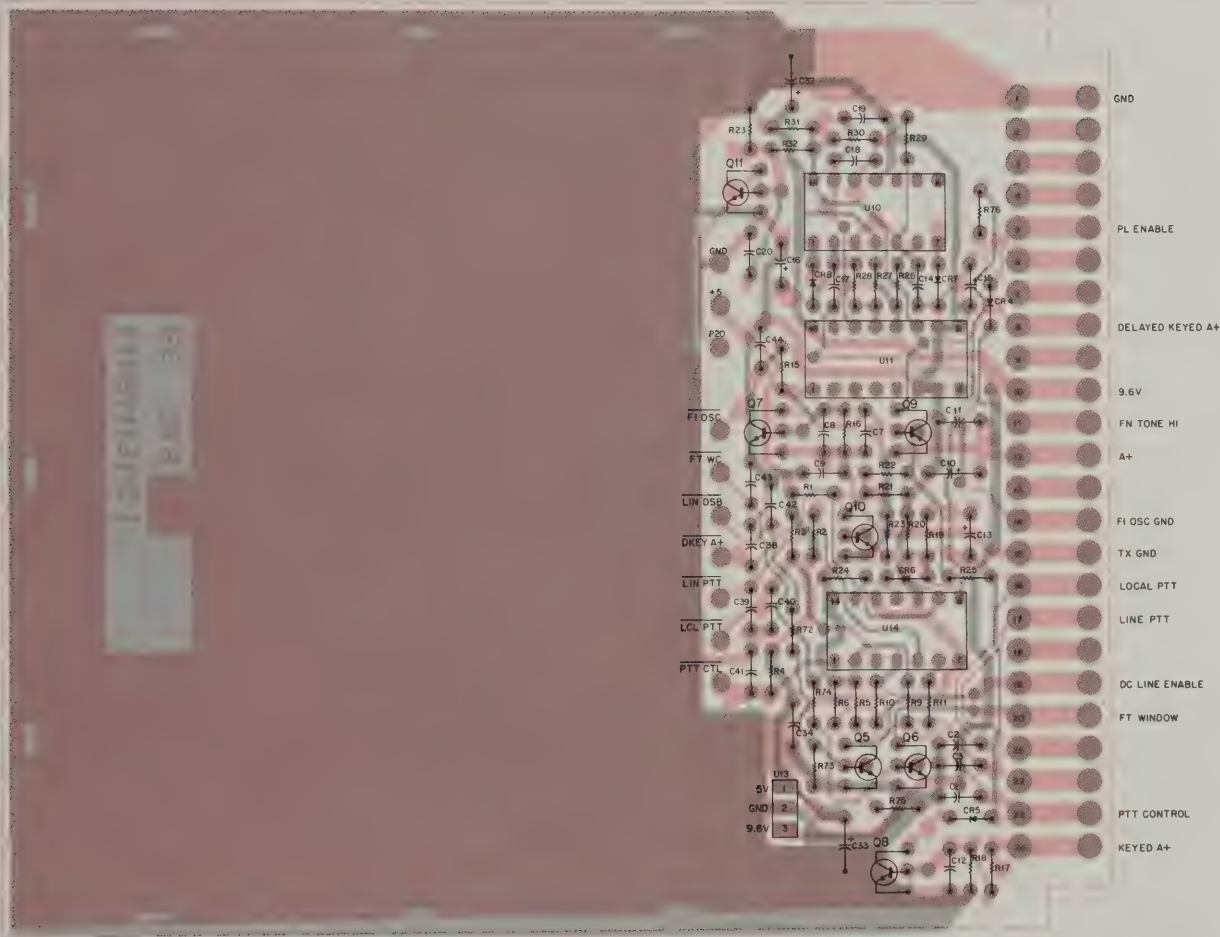
CIRCUIT BOARD DETAIL
TRN5379A CONTROL BOARD

parts list

TRN5379A Control Board PL-8320-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2, 3	21-11015B13	capacitor, fixed:
C6	23-84538G06	.001 uF ± 10%; 100 V
C7, 8, 9	21-11015A05	47 uF ± 20%; 20 V
C11	21-11015A07	.0047 uF + 80 - 20%; 100 V
C12	21-82187B04	.01 uF + 80 - 20%; 100 V
C13	23-82783B24	270 pF ± 10%; 500 V
C14	21-82610C58	15 uF ± 10%; 25 V
C15, 16	23-11019A09	100 pF ± 10%; 100 V
C17, 18	21-82610C58	1.0 uF ± 20%; 50 V
C19	21-11015B13	100 pF ± 10%; 100 V
C20	21-82187B04	.001 uF ± 10%; 100 V
C32	23-84538G06	270 pF ± 10%; 500 V
C34	21-11015A07	47 uF ± 20%; 20 V
C38 thru 41	21-11015B13	.01 uF + 80 - 20%; 100 V
C42, 43, 44	21-83406D81	.001 uF ± 10%; 100 V
		20 pF ± 5%; 500 V
CR4	48-82392B03	diode: (see note)
CR5, 6	48-83654H01	silicon
CR7, 8	48-84616A01	silicon
		Hot carrier
Q5, 6	48-869642	transistor: (see note)
Q7	48-869567	NPN; type M9642
Q8	48-869642	NPN; type M9567
Q9	48-869328	NPN; type M9642
Q10	48-869643	PNP; type M9328
Q11	48-869642	PNP; type M9642
		resistor, fixed; ± 5%; 1/4 W;
		unless otherwise stated
R1, 2, 3, 4	6-11009E65	4.7k
R5, 6	6-11009E73	10k
R9, 10, 11	6-11009E97	100k
R15	6-11009E61	3.3k
R16	6-11009E79	18k
R17	6-11009E65	4.7k
R18	6-11009E73	10k
R19	6-11009E53	1.5k
R20	6-11009E79	18k
R21	6-11009E49	1k
R22	6-11009E45	680
R23	6-11009E75	12k
R24	6-11009E73	10k
R25	6-11009E53	1.5k
R26	6-11009E63	3.9k
R27	6-11009E47	820
R28	6-11009E63	3.9k
R29	6-11009E57	2.2k
R30	6-11009F22	1 meg.
R31, 32	6-11009E87	39k
R33	6-11009E93	68k
R72	6-11009E61	3.3k
R73	6-11009E79	18k
R74	6-11009E61	3.3k
R75	6-11009E79	18k
R76	6-11009E97	100k
U10	51-83629M09	Integrated circuit: (see note)
U11	51-84887K60	Quad Low Power Operational Amplifier
U13	51-84561L76	Analog Multiplexer
U14	51-82764K29	Voltage Regulator (1.5A)
		Hex Buffer
		mechanical parts
2-132616		NUT, 6-32 x 1/4 x 3/32 x 1/8"
3-136194		SCREW, machine: 6-32 x 3/8"
7-84560N01		BRACKET, heat sink mounting
26-84434N01		SHIELD

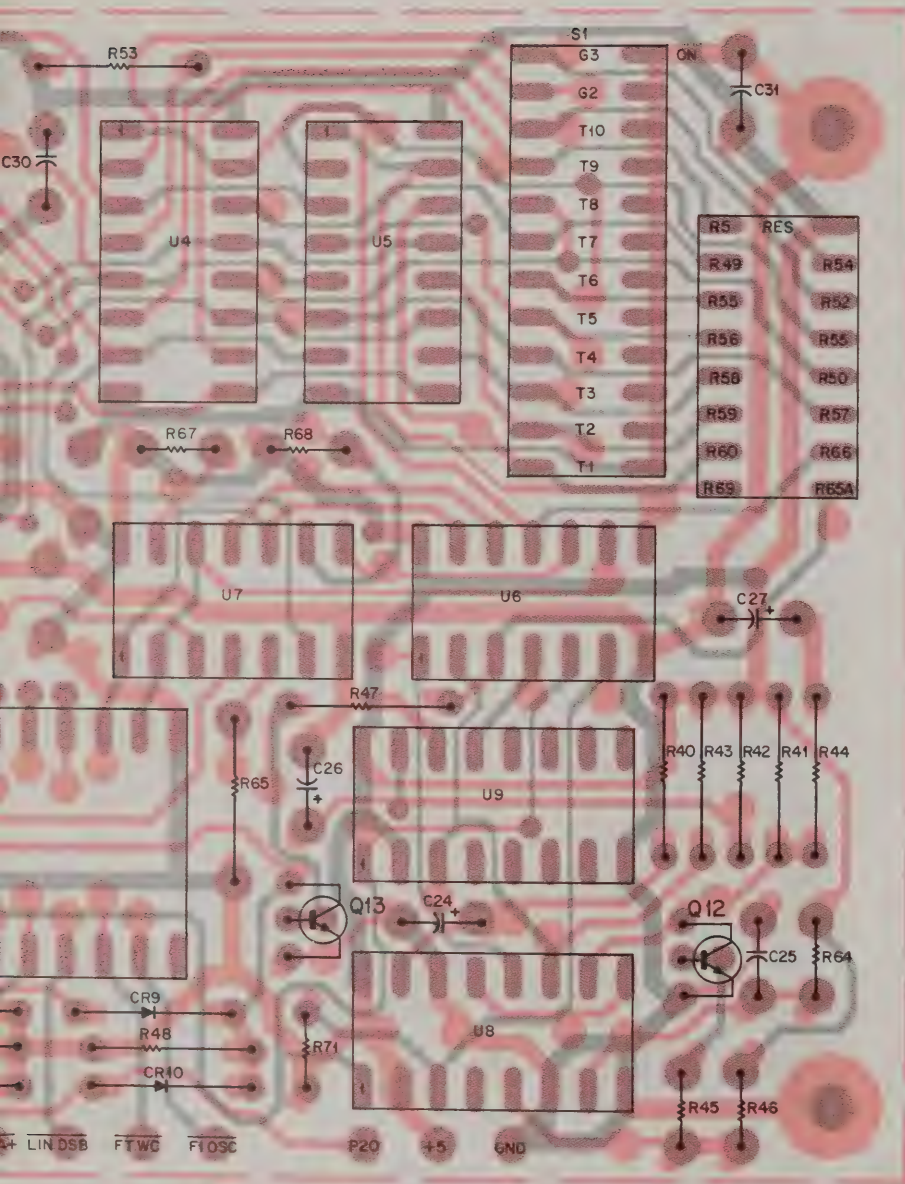
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE: BD-DEPS-35432-0
SOLDER SIDE: BD-DEPS-35433-0
OL-DEPS-35434-0

SIMULCAST CONTROL MODULE



COMPONENT SIDE BD-DEPS-35435-0
 SOLDER SIDE BD-DEPS-35436-0
 OL-DEPS-35437-0

SIDE

MULCAST CONTROL MODULE

MODEL TLN2559A



FUNCTION

Decodes Function Tone signals and keys the transmitter in response to correct code sequences.

parts list

TRN5625A Control Module Hardware Kit

PL-8319-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-125790	SCREW, machine: 4-40 x 5/16"; 6 used
	45-83914G01	GUIDE, card; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L16	PANEL

SIMULCAST CONTROL MODULE

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(Sheet 3 of 3)

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SIMULCAST CONTROL BOARD

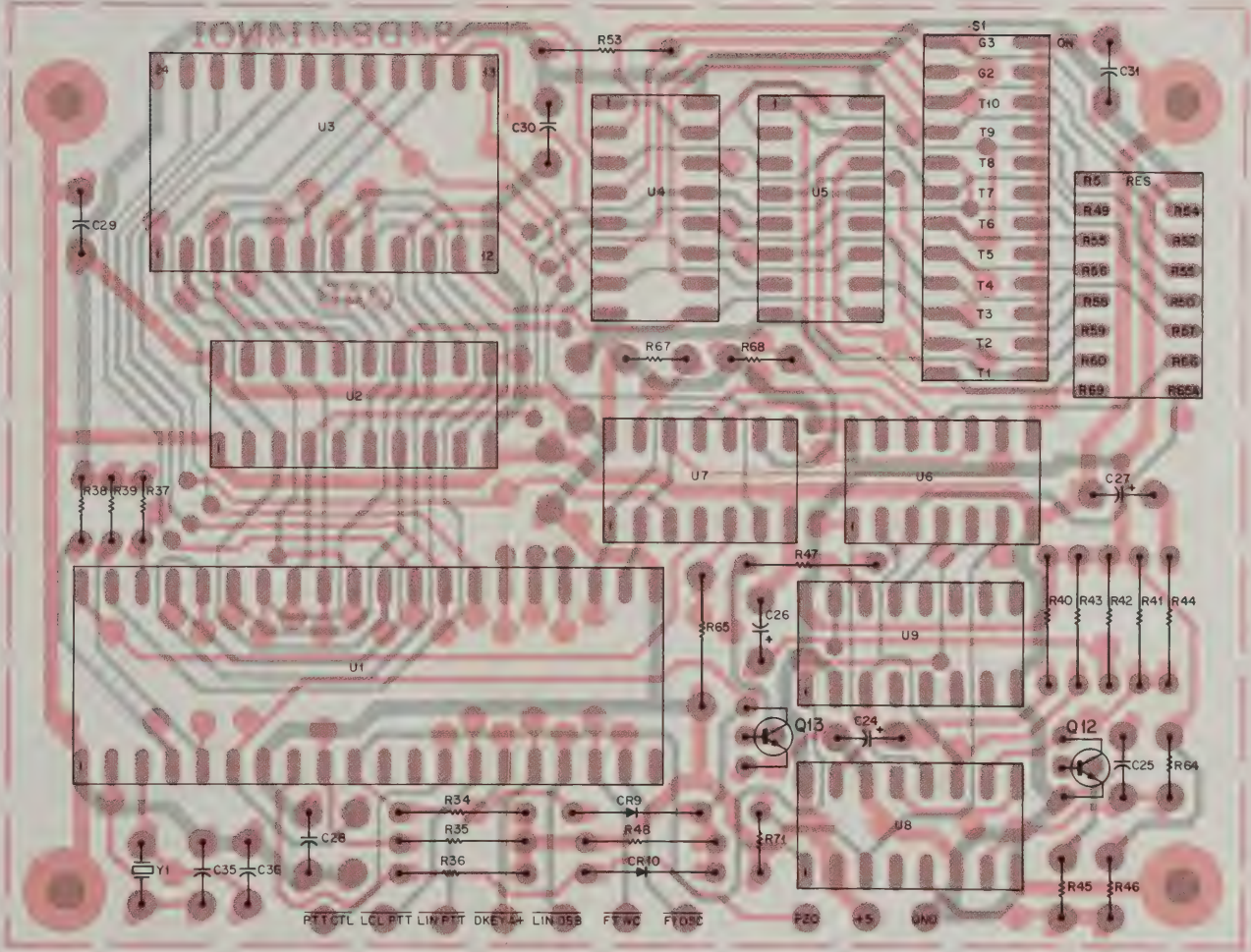
CIRCUIT BOARD DETAIL
TRN5603A LOGIC BOARD

parts list

TRN5603A Logic Board PL-8321-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C24	23-11013D09	capacitor, fixed: 4.7 uF ± 10%; 20 V
C25	8-11017A15	
C26	23-11013D09	
C27	23-11013C56	
C28 thru 31	21-11015A07	
C35, 36	21-11014H35	27 pF ± 5%; 100 V
CR8, 9	48-82392B03	diode: (see note) silicon
Q12, 13	48-869642	
		transistor: (see note) NPN; type M9642
		resistor, fixed; ± 5%; 1/4 W; unless otherwise stated
R34, 35, 36	6-11009C65	
R37	6-11009E65	4.7k
R38, 39	6-11009E25	100
R40	6-11009C97	100k
R41	6-11009C77	15k
R42	6-11009C73	10k
R43	6-11009C65	4.7k
R44	6-11009C10	24
R45	6-11009E17	47
R46	6-11009C51	1.2k
R47	6-11009C47	820
R48	6-11009C23	82
R49 thru 54	p/o 51-84333G23	3.3k resistor network
R55	p/o 51-84333G23	1.7k resistor network
R56 thru 60	p/o 51-84333G23	3.3k resistor network
R64	6-11009F04	180k
R65	6-11009C51	1.2k
R65A, 66	p/o 51-84333G23	3.3k resistor network
R67, 68, 69	6-11009E65	4.7k
R71	6-11009E73	10k
S1	40-83022M04	switch: 12 position; spst
U1	51-83625M06	integrated circuit: (see note) Microprocessor
U2	51-83627M03	
U3	51-83625M94	
U4, 5	51-84561L77	
U6	51-84371K83	
U7	51-84561L04	
U8, 9	51-84561L11	
Y1	48-82611M03	crystal: (see note) 3.9672 MHz
mechanical parts		
	9-84924E01	SOCKET, 24-contact
	14-84602K02	INSULATOR
	29-82713M01	TERMINAL, lug; 20 used

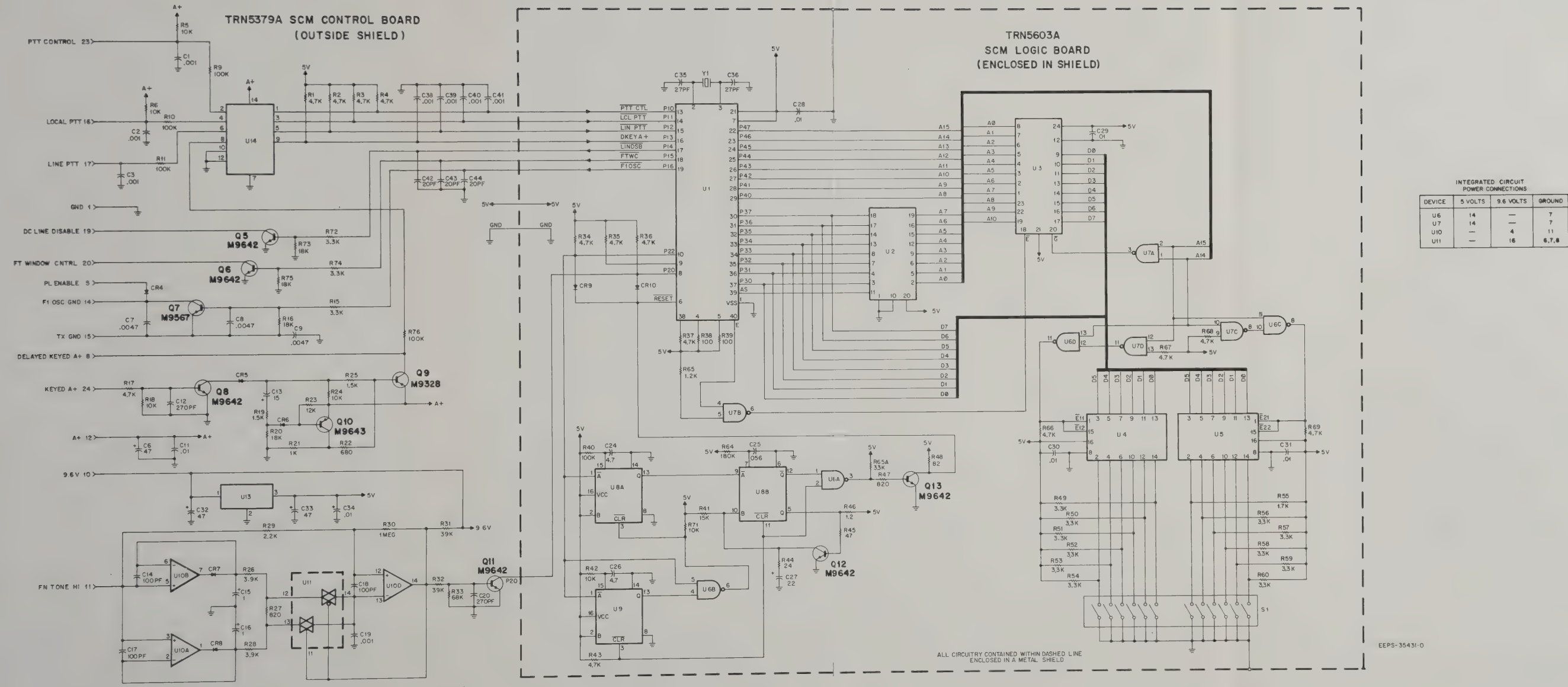
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE # BD-DEPS-35435-O
SOLDER SIDE # BD-DEPS-35436-O
OL-DEPS-35437-O

SIMULCAST CONTROL MODULE
MODEL TLN2559A



INTEGRATED CIRCUIT POWER CONNECTIONS

DEVICE	5 VOLTS	9.6 VOLTS	GROUND
U6	14	—	7
U7	14	—	7
U10	—	4	11
U11	—	16	6,7,8

FUNCTION

Decodes Function Tone signals and keys the transmitter in response to correct code sequences.

parts list

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-125790	SCREW, machine: 4-40 x 5/16"; 6 used
	45-83914G01	GUIDE, card; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L16	PANEL

SIMULCAST CONTROL MODULE

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A PURC Radio Paging Stations

REVISION DETAILS:

This revision updates SMR-4521, TLN2559A PURC Simulcast Control Module. The Group Selection Chart at the top of page 1 in section 68P81063E73 has been revised to read:

<u>Group</u>	<u>G2</u>	<u>G3</u>
0	ON	ON
1	OFF	OFF
2	ON	OFF
3	OFF	ON

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A PURC Radio Paging Stations
Instruction Manual

REVISION DETAILS:

The Paging Synthesizer frequency ranges have been expanded to include 132-150 MHz (TLD2592A Synthesizer) and 406-420 MHz (TLE2271A Synthesizer) bands. Modify parts list PL-8091 on PEPS-34989 with the following changes:

TLD9332A Synthesizer Brd. VHF 132-150 MHz	TLE5491A Synthesizer Brd. UHF 406-420 MHz	Motorola Part No.	Description
C42,43	C42,43	21-82537B45	Capacitor 5000 pF; $\pm 1\%$; 100 V
C715	C715	21-82610C70	150 pF; $\pm 5\%$; NPO
C716	C716	21-82610C44	100 pF; $\pm 5\%$; N220
C721	C721	21-82610C09	120 pF; $\pm 5\%$; N220
C722	C722	21-82610C30	68 pF; $\pm 5\%$; N330
C725	C725	21-83406D81	20 pF; $\pm 5\%$; NPO
C726	C726	21-83406D57	13 pF; $\pm 5\%$; NPO
R25,26	R25,26	6-84376L09	Resistor 7.6k; $\pm 0.5\%$; 1/4 W
R137	No Change	6-11009A90	51k; 5%; 1/4 W
Jumpers			
JU6,8	JU6,8	Remove	
JU5,7	JU5,7	Insert	



instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A PURC Radio Paging Stations
Instruction Manual

REVISION DETAILS:

Option C574AD modified the TLB1560A series Synthesizers to NON HIGH STABILITY operation. TPN1195A is deleted and the TLB1560A series is replaced by the TLB1570A series. Frequency stability is now determined by the 2.5ppm KXN1096A Oscillator.

TLB8502A, TLB8503A or TLB8504A Synthesizers are modified as follows. A jumper is added between U18 pin 7 and ground to disable the reference loop. (Located at top of the board at R60.)

RF Carrier Frequency adjustment is now made by warping the KXN1096A (U18).

To return the unit to High Stability Oscillator control the jumper described above is removed and a High Stability reference signal is connected to the Synthesizer Reference input J2 (a BNC connector located in the HSO cavity).

GENERAL SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic energy safety standard which applies to the use of this equipment. Proper use of this radio will result in exposure below the OSHA limit. The following precautions are recommended:

DO NOT operate the transmitter of a mobile radio when someone outside the vehicle is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of a fixed radio (base station, microwave and rural telephone rf equipment) or marine radio when someone is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

In addition,

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly grounded according to Motorola installation instructions for safe operation.

All equipment should be serviced only by a qualified technician.

Refer to the appropriate section of the product service manual for additional pertinent safety information.

EPS-28750-O



MOTOROLA INC.

Communications
Sector

PURC

RADIO PAGING STATIONS
CONTROL AND APPLICATION

SECTION

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TRN5349A NON-UNIFIED REMOTE CONTROL BOARD CIRCUIT BOARD DETAIL & PARTS LIST	PEPS-34629
TCN1282A UNIFIED REMOTE CONTROL CHASSIS INTERCONNECT CHART	EEPS-34673
TRN4860A UNIFIED REMOTE CONTROL BOARD CIRCUIT BOARD DETAIL & PARTS LIST	PEPS-34630
TRN5348A TRANSMITTER FLAT AUDIO BOARD CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-34631
TRN4856B DIGITAL MODULATOR MODULE CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-34632
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TRN4853A TRANSMITTER SITE INTERFACE MODULE CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-34633
TRN4859A LINE DRIVER MODULE CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-34634
TRN4892A GUARD TONE DECODER MODULE CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-34635
TRN4854B STATION CONTROL MODULE CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-35213
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TLE1720B SERIES EXCITER/1ST BANDPASS FILTER, AND TLE1600B SERIES TRIPLER/LOW LEVEL AMPLIFIER, CIRCUIT BOARD DETAIL, SCHEMATIC DIAGRAM & PARTS LIST	PEPS-18716
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FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 900 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area and district service managers and district representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender"® and "Vibrasponder"® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, PROMs, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, PROMs, code plugs, *Vibrasender* and *Vibrasponder* resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used; and should include any serial numbers stamped on the components being replaced.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and
Electronics Inc.
Communications & Electronics Parts
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS

1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS

1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7430
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS

7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8763
TWX: 710-862-1941

EAST CENTRAL AREA PARTS

12995 Snow Road,
Parma, Ohio 44130
Phone: 216-433-1560
TWX: 810-421-8845

EASTERN AREA PARTS

85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-444-9662
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS

P.O. Box 85036
San Diego, California 92138
Phone: 714-578-8030
TWX: 910-335-1516

GULF STATES AREA PARTS

1140 Cypress Station
P.O. Box 73115
Houston, Texas 77090
Phone: 713-537-3636
TWX: 910-881-6392

SOUTHWESTERN AREA PARTS

P.O. Box 34290
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-620-8511
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS

P.O. Box 368
Decatur, Georgia 30031
Phone: 504-987-2232
TWX: 810-766-0876

5.3 CANADIAN ORDERS

MOTOROLA LTD.

National Parts Department
3125 Steeles Avenue East
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-491-1032
Telex: 06-526258

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

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International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS, PROMs, AND RESONANT REED ORDERS

ALL MAIL ORDERS

Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE

Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131
Phone: 312-451-1297
TWX: 910-227-0799
Telex: 433-0067

MODEL CHART

FOR

LOWBAND/HIGHBAND

PURC RADIO PAGING STATIONS

CODE:

- = ONE SUPPLIED
- ★ = FREQUENCY SENSITIVE COMPONENT
- = INDICATES A MODEL SERIES

MODEL	OPERATING FREQUENCY	STATION TYPE		ITEM	DESCRIPTION
B93JZB1106A	136-174 MHz	NON-SYNTHESIZED	●	KXN1028B	CHANNEL ELEMENT (5 PPM TRANSMIT)
B91JZB1106A	30-50 MHz	NON-SYNTHESIZED	●	KXN1018C	CHANNEL ELEMENT (2 PPM TRANSMIT)
B91JZB1101A	30-50 MHz	NON-SYNTHESIZED	○	TFB6010A	HARMONIC FILTER
B93JZB1101A	136-174 MHz	NON-SYNTHESIZED	★	TFB6012A	HARMONIC FILTER (30-36 MHz)
			★	TFB6013A	HARMONIC FILTER (36-42 MHz)
			★	TFB6014A	HARMONIC FILTER (42-50 MHz)
			●	TFD6090A	HARMONIC FILTER (136-174 MHz)
			○	TLB1550A	EXCITER DRIVER
			★	TLB1552A	EXCITER DRIVER (30-36 MHz)
			★	TLB1553A	EXCITER DRIVER (36-42 MHz)
			★	TLB1554A	EXCITER DRIVER (42-50 MHz)
			○	TLD2580A	EXCITER DRIVER
			★	TLD2581A	EXCITER DRIVER (136-150.8 MHz)
			★	TLD2582A	EXCITER DRIVER (150.8-162 MHz)
			★	TLD2583A	EXCITER DRIVER (162-174 MHz)
			○	TLB8140A	POWER AMPLIFIER
			★	TLB8142A	POWER AMPLIFIER (30-36 MHz)
			★	TLB8143A	POWER AMPLIFIER (36-42 MHz)
			★	TLB8144A	POWER AMPLIFIER (42-50 MHz)
			○	TLD5080A	POWER AMPLIFIER
			★	TLD5081A	POWER AMPLIFIER (136-150.8 MHz)
			★	TLD5082A	POWER AMPLIFIER (150.8-162 MHz)
			★	TLD5083A	POWER AMPLIFIER (162-174 MHz)
			●	TKN6733A	TRANSMITTER CABLE
			●	TLN1434A	TRANSMITTER SHIELD
			●	THN6194B	CABINET
			●	TRN5599A	AC JUNCTION BOX
			●	TLN5697A	METER PANEL
			●	TKN8284A	DIGITAL MODULATOR CABLE
			●	TLN1675A	CHASSIS METER & CABLE
			●	TRN8686A	SERVICE BOARD CARD PULLER
			●	TKN8214A	MODEM CABLE
			●	TLN4198A	AIR DUCT KIT
			●	TPN1131A	POWER SUPPLY HIGH VOLTAGE
			●	TPN1132A	POWER SUPPLY LOW VOLTAGE
			●	TRN5345A	STATION HARDWARE LOW BAND
			●	TRN5343A	STATION HARDWARE HIGH BAND
			●	TLN5703A	TRANSFORMER, KIT (POWER SUPPLY 250 W)
			●	TLN5704A	TRANSFORMER, KIT (POWER SUPPLY 375 W)
			●	TLN8799A	SERVICE BOARD
			●	TCN1383A	REMOTE CONTROL CHASSIS
			●	TLN2376A	GUARD TONE DECODER MODULE
			●	TLN4658A	F1 CONTROL MODULE
			●	TRN4853A	TRANSMITTER SITE INTERFACE MODULE
			●	TRN4854A/B	STATION CONTROL MODULE
			●	TRN4856B	DIGITAL MODULATION MODULE
			●	TRN4859A	LINE DRIVER MODULE
			●	TPN1195A	POWER SUPPLY, 24 V
			●	TRN5480A	SYNTHESIZER HARDWARE
			●	TRN5481A	PROM
			●	TLD2593A	SYNTHESIZER
			○	TLB1560A	SERIES SYNTHESIZER

MODEL	FREQ. RANGE
TLB1550A	30-50 MHz
TLD2580A	136-174 MHz

● = ONE SUPPLIED
■ = INDICATES A MODEL SERIES

		ITEM	DESCRIPTION
	●	TLD1950A	POWER AMPLIFIER & HEAT SINK
	●	TFD6100A	HARMONIC FILTER
	●	TLD5090A	POWER AMPLIFIER
	●	■TLD5320A	EXCITER
	●	TFD6110A	EXCITER FILTER
	●	TKN6569A	TRANSMITTER RF CABLE
	●	TLD5100A	POWER CABLE
	●	TLN5169A	SWITCH & CABLE
	●	TLN5074A	TERMINAL BRACKET
	●	TLN5741A	TRANSMITTER CHASSIS & HEAT SINK
	●	TRN5148A	TRANSMITTER HARDWARE
●	●	TLN4729B	INTERCONNECT BOARD
	●	TLB1470A	POWER AMPLIFIER & HEAT SINK
	●	TLB8150A	POWER AMPLIFIER
	●	■TLB8170A	EXCITER
	●	TFB6020A	LOW PASS FILTER
	●	TKN6569A	TRANSMITTER RF CABLE
	●	TKN6580A	POWER AMPLIFIER CABLE
	●	TLB6940A	POWER CONTROL BOARD
	●	TLN5170A	TRANSMITTER METER SWITCH & CABLE
	●	TLN5740A	CAP NETWORK
	●	TRN6423A	RF CONNECTOR
	●	TRN6167A	TRANSMITTER CHASSIS & HEAT SINK
	●	TLN5075A	BRACKET
	●	TRN5417A	TRANSMITTER HARDWARE
	●	NOTE 1*	
	●	NOTE 2*	

*NOTES:

- vi

MODEL CHART

FOR

LOWBAND/HIGHBAND

PURC RADIO PAGING STATIONS

CODE:

- = ONE SUPPLIED
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- = INDICATES A MODEL SERIES

MODEL	OPERATING FREQUENCY		STATION TYPE	
	30-50 MHz	30-50 MHz	NON-SYNTHESIZED	NON-SYNTHESIZED
C71JZB1101A				
C71JZB1106A				
C73JZB1101A				
C73JZB1106A				
ITEM DESCRIPTION				
●●				KXN1116AA CHANNEL ELEMENT (20 PPM TRANSMIT)
●●				KXN1018C CHANNEL ELEMENT (2 PPM TRANSMIT)
●●				TCN1381A REPEATER CONTROL CHASSIS
●●				THN6318A CABINET
●●				TKN6581A RF CABLE
●●				TKN6582A RF CABLE
●●				TKN6883A REPEATER CABLE
●●				TKN6918A CABLE KIT (USED ON TRANSMIT ONLY STATIONS)
●●				TKN8214A MODEM CABLE
●●				TKN8284A MODULATOR CABLE
○●				TLB1400A POWER AMPLIFIER
★				TLB1412C POWER AMPLIFIER, 100 W (30-36 MHz)
★				TLB1413C POWER AMPLIFIER, 100 W (36-42 MHz)
★				TLB1414C POWER AMPLIFIER, 100 W (42-50 MHz)
				TLD1690D POWER AMPLIFIER
				TLD1692D POWER AMPLIFIER, 100 W (132-150.8 MHz)
				TLD1693E POWER AMPLIFIER, 110 W (150.8-162 MHz)
				TLD1694E POWER AMPLIFIER, 110 W (162-174 MHz)
○				TLB1560A SYNTHESIZER
★				TLB1562A SYNTHESIZER (30-36 MHz)
★				TLB1563A SYNTHESIZER (36-42 MHz)
★				TLB1564A SYNTHESIZER (42-50 MHz)
				TLD2061A EXCITER AND FILTER BOARD (132-150.8 MHz)
				TLD2062A EXCITER AND FILTER BOARD (150.8-174 MHz)
				TLD2593A SYNTHESIZER
○				TLB8270A EXCITER
★				TLB8272A EXCITER (30-36 MHz)
★				TLB8273A EXCITER (36-42 MHz)
★				TLB8274A EXCITER (42-50 MHz)
●●				TLN2376A GUARD TONE DECODER MODULE
●●				TLN4290B AUDIO PA MODULE
●●				TLN4658A F1 CONTROL MODULE
●●				TLN5902A TRANSMITTER SHIELD KIT
●●				TLN5903A RECEIVER SHIELD KIT
●●				TLN5914A RECEIVER SHIELD KIT
●●				TLN8799A SERVICE BOARD
●●				TPN1110B POWER SUPPLY
●●				TPN1195A POWER SUPPLY, 24 V
●●				TRN4853A TRANSMITTER SITE INTERFACE MODULE
●●				TRN4854A/B STATION CONTROL MODULE
●●				TRN4856B DIGITAL MODULATOR MODULE
●●				TRN4859A LINE DRIVER MODULE
●●				TRN5342A STATION HARDWARE, HIGH BAND
●●				TRN5344A STATION HARDWARE, LOW BAND
●●				TRN5359A AC JUNCTION BOX
●●				TRN5480A SYNTHESIZER HARDWARE
●●				TRN5481A PROM
●●				TRN6006A AUDIO AND SQUELCH BOARD, 10 W
●●				TRN6007A AUDIO AND SQUELCH BOARD, 10 W
●●				TRN6423A RF CONNECTOR
●●				TRN8686A SERVICE BOARD CARD PULLER

**CONTROL CHASSIS
MODEL CHART
FOR
PURC RADIO PAGING STATIONS**

MODEL		FREQ. RANGE
TCN1381A		30-50 MHz and 132-174 MHz
TCN1382A		450-512 MHz

CODE:

● = ONE SUPPLIED

ITEM		DESCRIPTION
●	TLN5645A	TRANSMITTER REPEATER INTERCONNECT BOARD
●	TLN5646A	RECEIVER REPEATER INTERCONNECT BOARD
●	TLN5894A	TRANSMITTER REPEATER INTERCONNECT BOARD
●	TRN4860A	INTERCONNECT BOARD
●	TRN5436A	CHASSIS HARDWARE
●	TRN5437A	CHASSIS HARDWARE

EPS-35258-O

MODEL CHART

FOR UHF

PURC

RADIO PAGING STATIONS

CODE:

- = ONE SUPPLIED
- ★ = FREQUENCY SENSITIVE COMPONENT
- = INDICATES A MODEL SERIES

MODEL	OPERATING FREQUENCY				STATION TYPE	
	450-512 MHz	450-512 MHz	450-512 MHz	450-512 MHz	SYNTHESIZED	NON-SYNTHESIZED
B84JZB1101A	●	●	●	●	SYNTHESIZED	NON-SYNTHESIZED
B84JZB1106A	●	●	●	●	SYNTHESIZED	NON-SYNTHESIZED
C64JZB1101A	●	●	●	●	SYNTHESIZED	NON-SYNTHESIZED
C64JZB1106A	●	●	●	●	SYNTHESIZED	NON-SYNTHESIZED
ITEM DESCRIPTION						
●	●	●	●	●	KXN1052A	CHANNEL ELEMENT (TRANSMIT)
●	●	●	●	●	TCN1382A	CONTROL CHASSIS
●	●	●	●	●	THN6373A	HOUSING
●	●	●	●	●	THN6318A	HOUSING
●	●	●	●	●	TKN6804A	CABLE, 75 W
●	●	●	●	●	TKN8007A	CABLE HIGH POWER REPEATER
●	●	●	●	●	TKN8008A	CABLE, INTERCONNECT
●	●	●	●	●	TKN8214A	CABLE, MODEM
●	●	●	●	●	TKN8284A	CABLE, MODULATOR
○	○	○	○	○	TLE1600B	HYBRID AMPLIFIER/TRIPLER
★	★	★	★	★	TLE1603B	HYBRID AMPLIFIER/TRIPLER (450-470 MHz)
★	★	★	★	★	TLE1604B	HYBRID AMPLIFIER/TRIPLER (470-494 MHz)
★	★	★	★	★	TLE1605B	HYBRID AMPLIFIER/TRIPLER (494-512 MHz)
○	○	○	○	○	TLE1670B	NETWORK ANTENNA REPEATER
★	★	★	★	★	TLE1673B	NETWORK, ANTENNA REPEATER (450-470 MHz)
★	★	★	★	★	TLE1674B	NETWORK, ANTENNA REPEATER (470-494 MHz)
★	★	★	★	★	TLE1675B	NETWORK, ANTENNA REPEATER (494-512 MHz)
★	★	★	★	★	TLE1693A	POWER AMPLIFIER, 20 W (450-470 MHz)
★	★	★	★	★	TLE1694A	POWER AMPLIFIER, 20 W (470-512 MHz)
●	●	●	●	●	TLE1713A	POWER AMPLIFIER, 75 W (450-470 MHz)
●	●	●	●	●	TLE1714A	POWER AMPLIFIER, 60 W (470-512 MHz)
○	○	○	○	○	TLE1720B	EXCITER AND FILTER BOARD
★	★	★	★	★	TLE1723B	EXCITER AND FILTER BOARD (450-470 MHz)
★	★	★	★	★	TLE1724B	EXCITER AND FILTER BOARD (470-494 MHz)
★	★	★	★	★	TLE1725B	EXCITER AND FILTER BOARD (494-512 MHz)
○	○	○	○	○	TLE1930A	POWER AMPLIFIER
★	★	★	★	★	TLE1933A	POWER AMPLIFIER (450-470 MHz)
★	★	★	★	★	TLE1934A	POWER AMPLIFIER (470-494 MHz)
★	★	★	★	★	TLE1935A	POWER AMPLIFIER (494-512 MHz)
●	●	●	●	●	TLE2273A	SYNTHESIZER, 450-512 MHz
●	●	●	●	●	TLE4183A	TRANSMITTER SHIELD KIT
●	●	●	●	●	TLN1997A	METERING/INTERCOM KIT
●	●	●	●	●	TLN2376A	GUARD TONE DECODER MODULE
●	●	●	●	●	TLN4290B	AUDIO PA MODULE
●	●	●	●	●	TLN4658A	F1 CONTROL MODULE
●	●	●	●	●	TLN4296A	POWER CONTROL
●	●	●	●	●	TLN4296AV	POWER CONTROL
●	●	●	●	●	TLN5697A	METER PANEL
●	●	●	●	●	TLN5703A	TRANSFORMER
●	●	●	●	●	TLN8799A	SERVICE BOARD
●	●	●	●	●	TPN1110B	POWER SUPPLY
●	●	●	●	●	TPN1167A	POWER SUPPLY, LOW VOLTAGE
●	●	●	●	●	TPN1168A	POWER SUPPLY, HIGH VOLTAGE
●	●	●	●	●	TPN1195A	POWER SUPPLY, 24 V
●	●	●	●	●	TRN4853A	TRANSMITTER SITE INTERFACE MODULE
●	●	●	●	●	TRN4854A/B	STATION CONTROL MODULE
●	●	●	●	●	TRN4856A/B	DIGITAL MODULATOR MODULE
●	●	●	●	●	TRN4859A	LINE DRIVER MODULE
●	●	●	●	●	TRN5117A	STATION HARDWARE UHF
●	●	●	●	●	TRN5118A	STATION HARDWARE UHF HIGH POWER
●	●	●	●	●	TRN5198A	SYNTHESIZER HARDWARE
●	●	●	●	●	TRN5481A	PROM
●	●	●	●	●	TRN5359A	AC JUNCTION BOX
●	●	●	●	●	TRN6006A	AUDIO AND SQUELCH BOARD, 10 W
●	●	●	●	●	TRN6193A	TRANSMITTER SHIELD, 75 W
●	●	●	●	●	TRN6194A	RECEIVER SHIELD
●	●	●	●	●	TRN8580A	AC JUNCTION BOX
●	●	●	●	●	TRN8584A	BLOWER
●	●	●	●	●	TRN8686A	SERVICE BOARD CARD PULLER

SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. *However, CMOS circuits can be damaged by improper handling of the modules even in a system.*

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions.

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch *both* hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

NOTE

Wearing Conductive Wrist Strap (Motorola No. RSX-4015A) will minimize static buildup during servicing.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.

3. Normally, circuit modules can be inserted or removed with power applied to the unit. However,

check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

5. All electrically powered test equipment should be grounded. *Apply the ground lead from the test equipment to the circuit module before connecting the test probe.* Similarly, *disconnect the test probe prior to removing the ground lead.*

6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through 100k of resistance.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

7. When soldering, be sure the soldering iron is grounded.

8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.



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9. When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS

device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NON-CONDUCTIVE MATERIAL for packaging these modules.



1. INTRODUCTION

1.1 *PURC* (Paging Universal Remote Control) Radio

Paging Stations consolidate binary and sequential tone signaling control functions which are required in paging systems. *PURC* Radio Paging Stations accommodate 2-tone and 5/6-tone paging formats (either tone only or tone and voice) as well as binary formats. Binary paging requires FSK-NRZ (frequency shift keying with non-return to zero) signaling.

1.2 There are two modes of operation for *PURC* Radio Paging Stations:

- audio mode - corresponds to commonly used 2-tone or 5/6-tone pager addressing methods (for tone only or tone and voice pagers).

- binary mode - used in display paging and certain types of binary and voice pagers (binary address followed by voice message).

1.3 Control of *PURC* Radio Paging Stations can be accomplished locally (requires multiple paging terminal to base station connections) or remotely (requires one simplex control path). Remote control is required for distances greater than 100 feet. The following discussion refers to remote control operation.

2. STATION CONTROL

Regardless of whether the binary mode or audio mode of operation is selected, the station control sequence is initiated by 120-140 ms (milliseconds) of high

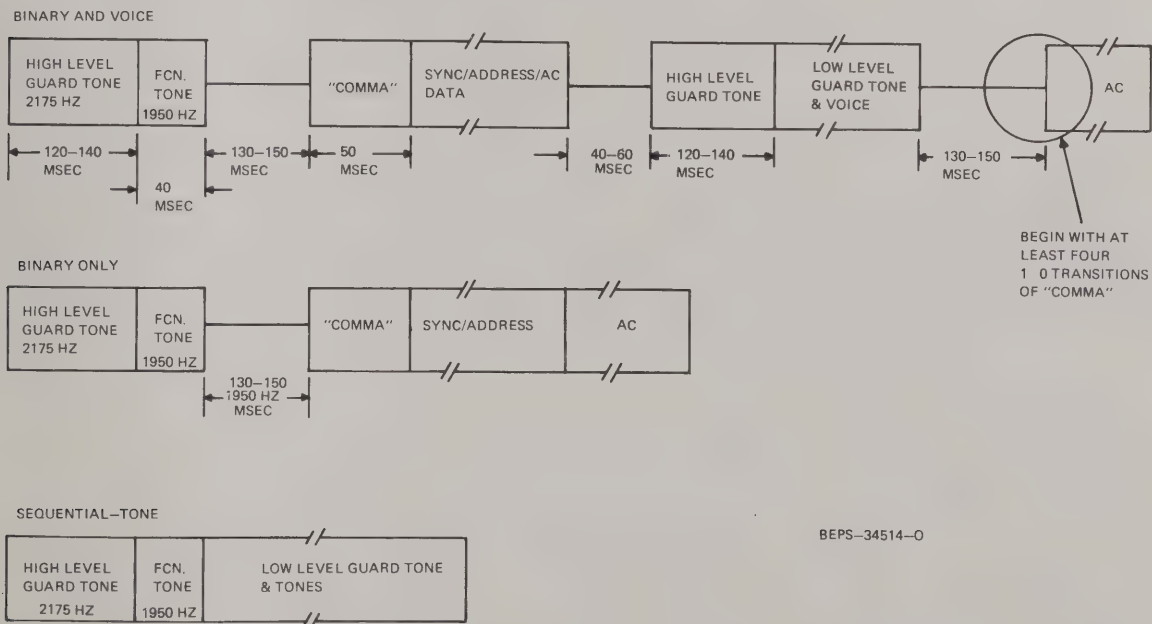


Figure 1. Single Transmitter Sequential Tone Control Format

level guard tone (2175 Hz) followed by 40 ms of function tone (1950 Hz). This sequence keys the base station through control signals originating in the guard tone decoder, F1 control, and station control modules. The rest of the control sequence depends on the type of information, binary or audio, to be transmitted.

3. BINARY CONTROL

(See Figure 1, Binary Only)

3.1 After the guard tone/function tone sequence, binary control is accomplished by a 130-150 ms pause before sending the binary information. This allows the guard tone decoder to drop out and uninhibit the modem in the station. During the 130-150 ms pause, the transmitter remains keyed by the delayed keyed A+ voltage from the digital modulator module. After the pause but before the station drops off the air, binary information is sent to the station. This information (binary preamble) must begin with 50 ms of an alternating binary 1,0 pattern (comma) received at 600 bps (bits per second). This binary information from the paging terminal is sent to the station via 1200/2200 Hz audio frequency shift signaling (modem tones). A

modem in the paging station decodes the modem tones into logic "1" and "0" dc states. These logic states are level shifted in the transmitter site interface and digital modulator modules for application to the modulator stage in the transmitter. Detection of a 1200 Hz tone is defined as a logic 1 and gives a positive shift to the transmitter carrier frequency. Detection of a 2200 Hz tone is defined as a logic "0" and gives a negative frequency shift to the transmitter carrier frequency.

3.2 The detection of the initial 600 bps binary pattern is immediately converted by the modem and TSI (Transmitter Site Interface) module into a modem PTT signal. This results in the station remaining keyed by reverting to the binary mode (FSK-NRZ). When the station has been properly set up in the binary mode, binary data is transmitted. The transmitter unkeys within 350 ms after the modem tones stop. During the time the station is in the binary mode, the modem PTT signal is routed to the guard tone decoder module to inhibit the audio mode. Therefore the binary and audio modes are independent of each other.

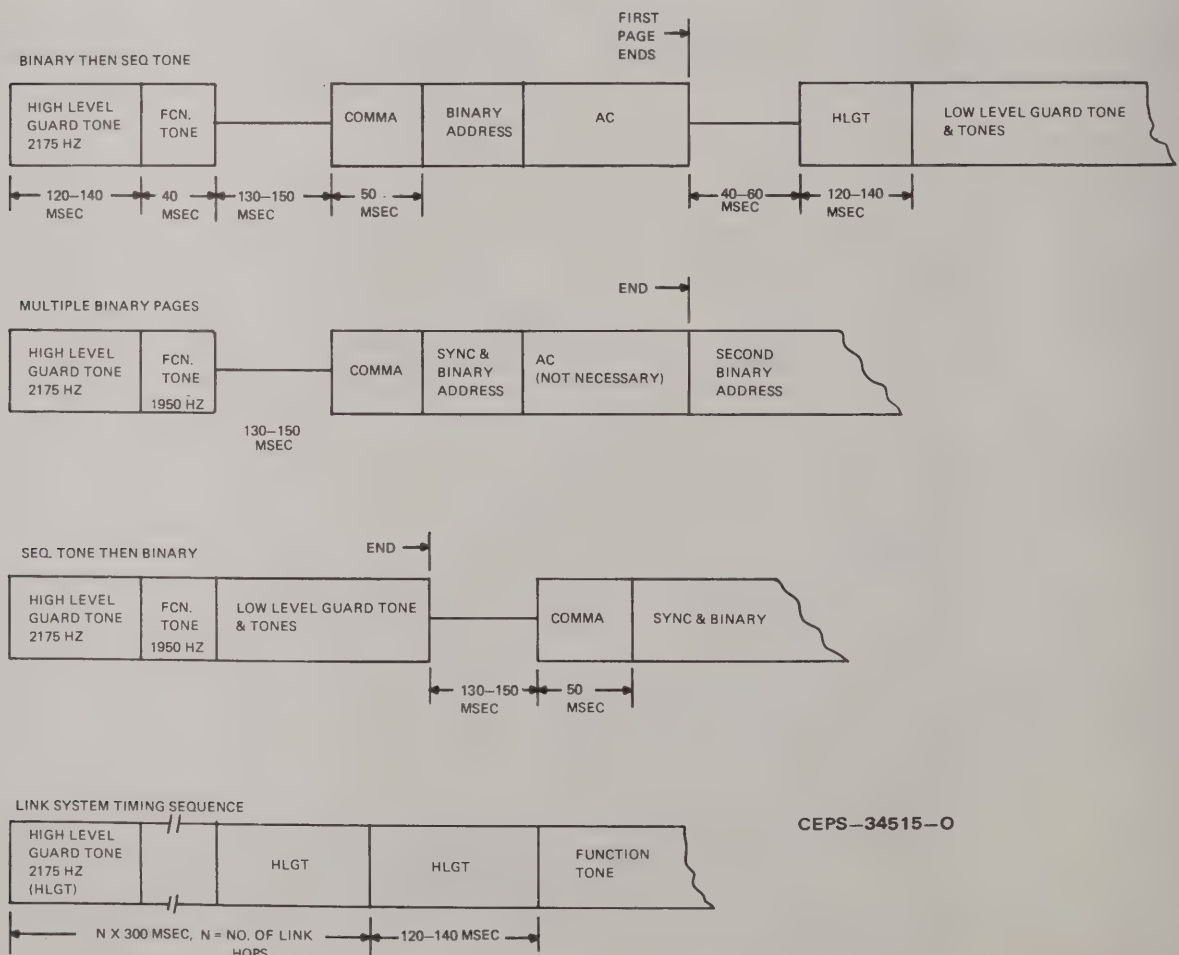


Figure 2. Sequential Tone/Binary Mixed Pager Tone Control Format

4. AUDIO CONTROL

(See Figure 1 Single Transmitter Sequential Tone Control Format)

4.1 After the initial guard tone function tone sequence, audio control is accomplished by sending low level guard tone without any delay after the function tone. The transmitter keys up and the desired paging tones and voice (if required) are then transmitted. Low level guard tone is present during the entire transmission to keep the transmitter keyed. When low level guard tone is removed, the station unkeys within approximately 350 msec. The continuous detection of low level guard tone keeps the modem in the station muted via a relay in the TSI (Transmitter Site Interface) module.

4.2 High level guard tone and function tone are sent at +5 dB and -5 dB respectively, referenced to test tone (test tone is the level of 1000 Hz requires to modulate the transmitter ± 3 kHz). Low level guard tone is sent out at a level -25 dB referenced to test tone.

5. COMBINED BINARY AND AUDIO CONTROL

(See Figure 1 and Figure 2)

5.1 A combination of binary and audio control is required for paging in systems with mixed binary and tone signaling, or where tone and voice pagers are used which require a binary address. To initially establish control of the station, high level guard tone and function tone is required as previously described (paragraph 2). Binary or audio control is then established as previously described (paragraphs 3 and 4). If the audio mode is first established and it is desired to switch to the binary mode, a pause of 130-150 ms is sent by the terminal to allow the station to drop out of the audio mode. Binary information is sent out, beginning with 50 ms of comma (alternating 1 and 0 pattern). The remainder of the binary information follows the comma. If multiple binary paging (without voice message) is required, the binary data must be sent without any pauses to prevent the station from unkeying.

5.2 To switch from the binary mode to the audio mode, a 50 ms pause is sent to allow the station to drop out of the binary mode (loose modem PTT signal). High level guard tone is sent by the paging terminal for 120-140 ms followed immediately by the low level guard tone. The function tone (1950 Hz) is not required. Paging tones or voice is then sent to the station along with continuous low level guard tone. To switch back to the audio mode requires a 130-150 ms pause followed by binary information. In the audio mode loss of low level guard tone results in the station unkeying within 350 msec, provided no other information is sent to the station. Similarly, for the binary mode, the station will unkey within 350 msec after modem tones have ended (as sent by the terminal).

6. MULTIPLE PAGE TIMING

Once the station is successfully keyed in either the audio or binary mode, multiple pages of any format may be sent by adhering to the timing required for the audio mode, binary mode, or alternating between audio and binary modes. If paging activity has stopped for more than 160 msec between successive pages to be transmitted, the paging terminal must send a high level guard tone and function tone (1950 Hz) sequence before access to either the audio or binary mode can be determined.

7. LINK STATION TIMING

(See Figure 2 last figure)

When rf control links are used instead of telephone lines, the initial high level guard tone must be extended to insure each transmitter is up to full power and each link receiver is unsquelched. To insure that this condition exists, and additional 300 ms of high level guard tone is sent out for each link (hop).

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Sector

JUMPER OPTIONS AND TRANSMIT AUDIO LEVEL SETTING

1. JUMPER OPTIONS

The following jumper information is provided to indicate jumper applicability in various *PURC* Radio Paging Stations.

1.1 RECEIVE AUDIO AND SQUELCH BOARD (OPTIONAL)

Jumper	Carrier Squelch	Tone PL Squelch	Digital PL Squelch
JU201	IN	OUT	IN
JU202	IN	OUT	IN
JU203	IN*	IN*	IN*
JU204	IN	IN**	IN**

* IN for 10 W audio

** cut for "and squelch"

1.2 EXCITER

Jumper	Pre-Emphasis	Options	
		Flat Audio	VAR
JU401	OUT	OUT	OUT
JU402	OUT	IN	IN
R401	OUT	OUT	OUT
R402, 3	IN	OUT	OUT
R405	OUT*	OUT*	OUT*

* IN for PL input on Exciter pin 5

1.3 RECEIVER INTERCONNECT BOARD

For full duplex operation on the TLN6196A model board, remove CR957.

1.4 DIGITAL PL SQUELCH DECODER BOARD

Jumper	Normally
JU801	IN
JU802	OUT
JU803	OUT

1.5 FLAT AUDIO BOARD (OPTION)

Jumper	Low Band	Mid Band	VHF	UHF	900
JU1	OUT	IN	OUT	OUT	IN
JU2	IN	OUT	IN	IN	OUT
JU3	OUT	OUT	OUT	OUT	IN
JU4	OUT	IN	OUT	OUT	OUT
JU5	IN	OUT	OUT	IN	OUT
JU6	OUT	OUT	IN	OUT	OUT
JU7	IN	IN	IN	IN	OUT
JU8	IN	IN	IN	IN	OUT
JU9	OUT	OUT	OUT	OUT	IN
JU10	IN FOR ONLY FLAT AUDIO OPTION				

1.6 F1 CONTROL MODULE

Part or Jumper	Normal Condition
JU1	NOT USED
JU2	IN
JU3	OUT (in on TLN4638A)
C23	IN (out with co-located link receiver)
C32	IN (out with co-located link receiver)

1.7 VOICE ACTUATED RESPONSE (VAR) OPTION

JUMPER		Hang Times		
		1 sec	0.5 sec	50 ms
		Nominal		
JU4		OUT	OUT	OUT
JU5		OUT	OUT	IN
JU6		OUT	OUT	IN
JU7		OUT	IN	IN
JU8	Normally IN	OUT	for C42JZB Link Station	

JUMPER OPTIONS & TRANSMIT AUDIO LEVEL SETTING

technical writing services

1.8 TRANSMITTER SITE INTERFACE MODULE (MODEL TRN4853A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN for signal detect key-up
JU2	IN	OUT for inverted data
JU3	OUT	IN for inverted data
JU4	IN	OUT for 387 Hz verification
JU5	IN	OUT when negative voltage module is used
JU6	OUT	IN when modem is removed
JU7	NOT USED	
JU8	IN	OUT when negative voltage module is used

1.9 DIGITAL MODULATOR MODULE (MODEL TRN4856B)

The following components must be removed depending on the quiescent output voltage of the channel element.

Voltage	Components
3.98 V - 4.5 V	Remove R24, VR2
4.50 V - 5.0 V	Remove R24, R25, VR2
5.00 V - 5.5 V	Remove R11, R24, R25, VR2
7.80 V - 8.2 V	Remove R25, VR1
8.2 V - 8.5 V	Remove R11, R25, VR1

1.10 STATION CONTROL MODULE (MODEL TRN4854B)

Jumper	Normal Condition	Special Applications
JU1	IN	OUT for special applications
JU2	IN	OUT for special applications
JU3	IN	OUT for special applications
JU4	IN	OUT for guard tone or modem keying
JU5	IN	OUT for special applications
JU6	IN	OUT for duplex stations
JU7	OUT	IN for PL squelch
JU8	IN	OUT when simulcast control module used

Note: Remove Q12 when using simulcast control module.

1.11 LINE DRIVER MODULE (MODEL TRN4859A)

Jumper	Normal Condition	Special Applications
JU1	NOT USED	
JU2	NOT USED	
JU3	OUT	IN for 2-wire stations
JU4	OUT	IN for 2-wire stations
JU5	NOT USED	
JU6	NOT USED	
JU7	IN	OUT for special applications
JU8	IN	OUT for special applications
JU9	IN	OUT for special applications
JU10	OUT	IN for rcvr line levels of ± 10 dBm
R21	IN	OUT for 2-wire stations
R55	OUT	IN for non-binary stations

1.12 UNIFIED REMOTE CONTROL BOARD (MODEL TRN4860A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN to remove xmit notch
JU2	OUT	IN for guard-tone only or modem keying
JU3	IN	OUT for non-pre-emphasized xmit audio
JU4	OUT	IN for flat xmit audio
JU5	OUT	IN when using var module
JU6	OUT	IN to remove receive notch
JU7	OUT	IN for non-binary paging applications or non-PL link applications

1.13 NON-UNIFIED REMOTE CONTROL BOARD (MODEL TRN5349A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN to remove xmit notch
JU2	OUT	IN for guard tone only or modem keying
JU3	IN	OUT for non-pre-emphasized xmit audio
JU4	OUT	IN for flat xmit audio
JU5	OUT	IN when using var module
JU6	OUT	IN to remove receive notch
JU7	OUT	IN for non-binary paging or non-PL link applications
JU8	OUT	NOT USED
JU9	OUT	IN when using T.O.T option
JU10	OUT	IN for C42JZB link xmtrs
JU11	OUT	IN when using T.O.T option
JU12	OUT	IN for C42JZB link xmtrs
JU13	OUT	IN when using negative voltage module
JU14	OUT	IN For C42JZB link xmtrs
JU15	IN	OUT when using simulcast control module
JU16	OUT	IN for C42JZB link xmtrs

1.14 GUARD TONE DECODER (MODEL TRN4892A)

Jumper	Normal Condition	Special Application
R91	IN	OUT for link receivers with zero dBm link level

2. TRANSMIT AUDIO LEVEL SETTING

NOTE

If station is used without a modem, add jumper JU6 to the TRN4853A Transmitter Site Interface module. JU6 provides a 600 ohm input to the module.

2.1 MAXIMUM DEVIATION CAPABILITY

With 1 volt RMS of 1 kHz audio at the exciter level input on the line driver module, increase transmitter deviation by rotating the exciter IDC control. Transmitter shall be capable of achieving the maximum deviation specified limit without evidence of modulation break up.

2.2 SET MAXIMUM DEVIATION

Step 1a. Pre-emphasize audio only - with modulation as in paragraph 2.1, adjust exciter IDC control for ± 5 kHz total deviation.

Step 1b. Flat audio only (TRN5348A only) - with modulation as in paragraph 2.1. Adjust flat audio IDC control fully clockwise. Adjust exciter IDC control for ± 5 kHz total deviation.

Step 2. Voice Actuated Response (VAR) both flat and pre-emphasized - disable VAR and set switch to FLAT.

Step 3. With modulation per paragraph 2.1, adjust exciter IDC control for ± 5 kHz total deviation.

2.3 EXCITER AUDIO SENSITIVITY

Reduce the input level for 60% of rated deviation. Record the audio voltage at XCTR LEVEL jack on line driver module.

2.4 TRANSMIT LINE LEVEL

NOTE

If the station has a VAR module, it must be disabled and set to the flat mode.

Step 1a. Apply a 1 KHz test tone into the station on the 600 ohm line terminals and adjust the XCTR LEVEL control on the line driver module for ± 3 kHz deviation.

Step 1b. With the VAR option, and the same modulation as in Step 1a, adjust the XCTR LEVEL control on the VAR module for ± 3 kHz deviation, with the VAR module disabled and set to the PRE-EMPHASIZED mode.

Step 2. Re-enable VAR module when above adjustments are completed.

3. FREQUENCY SHIFT KEYING (FSK) DEVIATION

Step 1. Line disable the station via switch on station control module.

Step 2. Set the T.S.I. test switch to the TEST position, and place the DEVIATION switch to the + position. The binary deviation can be read as the output frequency (fo) minus the carrier frequency (fc).

Step 3. Adjust the + DEVIATION control on the digital modulator module until fo-fc equals +4.0 kHz.

Step 4. Place the DEVIATION switch to the - position and adjust the -DEVIATION control for fo-fc equals -4.0 kHz.

Step 5. Return the TEST switch to its normal position.

FUNCTION

The station tone/function. The guard transform module. Line PTT tion control, thus pass function.

A line PTT control module binary mode Transmitter

The F1 Control ground and these lines

Channel enable all keyed A-, A+ is present and being the

After the millisecond Keyed A+ delayed key millisecond during tone

If the station not present modem tone in the line carrier detector module re considers signal, it goes PTT function sequence to modem PTT the line driver carrier. In by modem the binary to the digital data and producing the (FSK-NRZ

U4 & ADD R21 (LINE DRIVER).

(TSI) OR R55 (LINE DRIVER).

ADD JU2 (INTERCONNECT BRD).

JU1 IS REMOVED FROM INTERCONNECT

VOLTAGE MODULE, REMOVE JU5 & JU8

7 HZ VERIFICATION.

BE JUMPED FOR:

ON

TO THE TSI MODULE.

NO

E.

TSI MUST BE ADDED IN ORDER TO PROVIDE

V-

MODEM SEC XMIT DATA

RELAY CLOSURE

RELAY CLOSURE

Station Block Diagram
Motorola No. PEPS-34628-A
10/5/82 - V & G

FUNCTIONAL DESCRIPTION

The station is first keyed up in the audio mode by guard tone/function tone (2175 Hz and 1950 Hz, respectively). The guard tone is coupled from the line by line driver transformer, T1, and routed to the guard tone decoder module. The guard tone decoder module generates a Line PTT upon detection of the 2175 Hz signal. The station control module then opens the function tone window, thus allowing the guard tone decoder module to pass function tones and enabling the tone decoders.

A line PTT produces keyed A+ from the station control module and prevents the station from entering the binary mode by removing the modem via relay K1 in the Transmitter Site Interface (TSI) module.

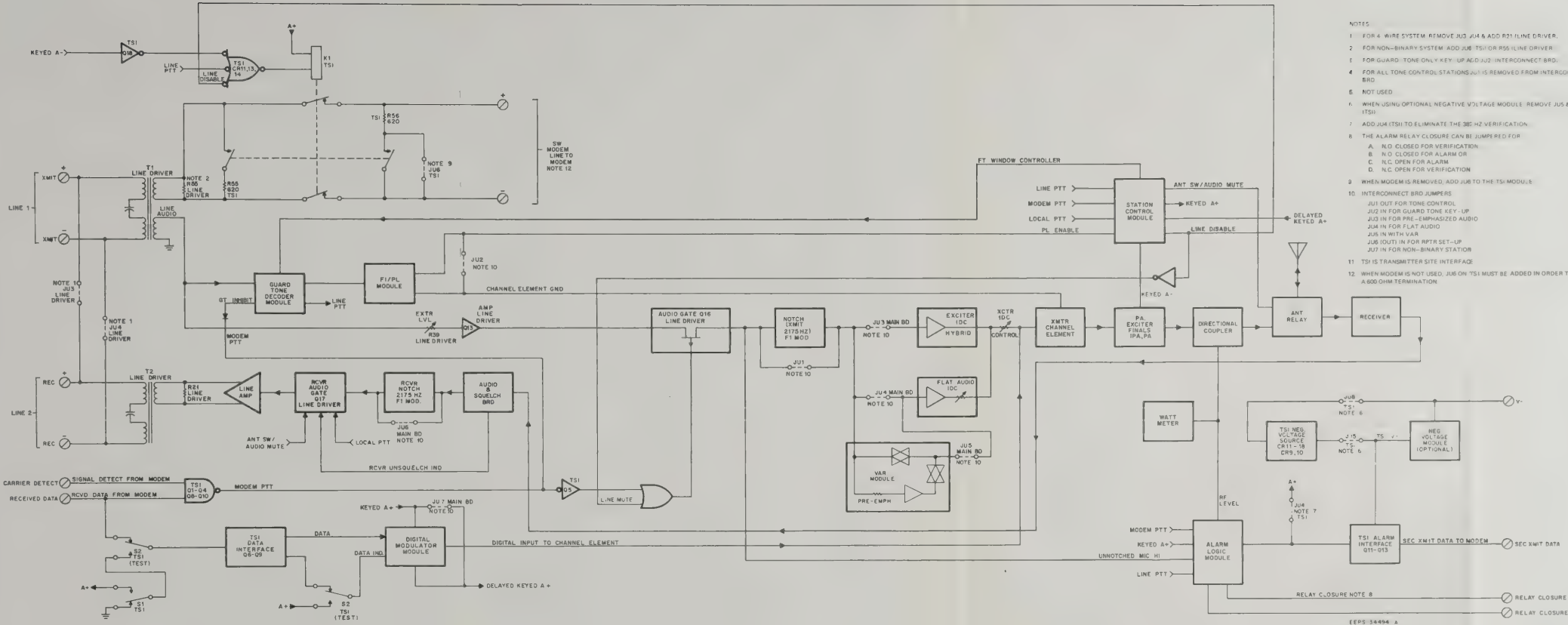
The F1 Control Module produces an F1 channel element ground and PL enable with the detection of 1950 Hz, these lines are latched until the station un- keys.

Channel element ground turns on the element and PL enable allows the station control module to generate keyed A-, provided either keyed A+ or delayed keyed A+ is present. Keyed A- closes the function tone window and biases the final rf stages in the transmitter bringing the station up to full power.

After the function tone there is a delay of 130-150 milliseconds, which allows for the loss of line PTT. Keyed A+ is removed by the loss of the PTT signal, but delayed keyed A+ remains for an additional 160-200 milliseconds, preventing the station from un- keying during tone-binary or binary-tone transitions.

If the station is keyed while line PTT or line disable is not present, relay K1 in the TSI module allows the modem tones to be applied to the modem, again via T1 in the line driver module. The modem then generates carrier detect and received data signals. If the TSI module receives active data (active since the modem considers guard tone as static data) and a carrier detect signal, it generates a modem PTT function. The modem PTT function now replaces line PTT in the keying sequence to keep the station transmitter keyed. The modem PTT is used to open the transmit audio path in the line driver so the modem tones do not modulate the carrier. In addition, the guard tone decoder is disabled by modem PTT, therefore inhibiting line PTT while in the binary mode. The TSI module then passes the data to the digital modulator module which level shifts the data and de couples it to the channel element, thus producing the frequency shift keying-non-return to zero (FSK-NRZ) output.

If a voice message follows the binary information, another delay allows for the loss of modem PTT, then high level guard tone is again used to obtain line PTT. Once the station is keyed in the tone mode the voice (or paging tones in a tone system) is sent with the low level guard tone in order to maintain the line PTT function. The notch filter in the F1 control module removes the low level guard tone. Thus preventing it from being transmitted. The audio is routed from T1 in the line driver, through the notch filter and then to either the pre-emphasized or flat audio path in the exciter before modulating the channel element.



- NOTES
1. FOR 4 WIRE SYSTEM REMOVE JUS JUA & ADD R21 (LINE DRIVER).
 2. FOR NON-BINARY SYSTEM ADD JUS TSI1 OR R55 (LINE DRIVER).
 3. FOR GUARD TONE ONLY KEY-UP ADD JUS2 INTERCONNECT BRD.
 4. FOR ALL TONE CONTROL STATIONS JUS1 IS REMOVED FROM INTERCONNECT BRD.
 5. NOT USED.
 6. WHEN USING OPTIONAL NEGATIVE VOLTAGE MODULE REMOVE JUS & JUS TSI1.
 7. ADD JUS1 TSI1 TO ELIMINATE THE 265 HZ VERIFICATION.
 8. THE ALARM RELAY CLOSURE CAN BE JUMPED FOR:
A. N/O CLOSED FOR VERIFICATION
B. N/O CLOSED FOR ALARM OR
C. N/O OPEN FOR ALARM
D. N/O OPEN FOR VERIFICATION
 9. WHEN MODEM IS REMOVED, ADD JUS TO THE TSI MODULE.
 10. INTERCONNECT BRD JUMPERS
JUS1 OUT FOR TONE CONTROL
JUS2 IN FOR GUARD TONE KEY-UP
JUS3 IN FOR PRE-EMPHASIZED AUDIO
JUS4 IN FOR FLAT AUDIO
JUS5 IN WITH VAR
JUS6 OUT IN FOR RPTR SET-UP
JUS7 IN FOR NON-BINARY STATION
 11. TSI IS TRANSMITTER SITE INTERFACE.
 12. WHEN MODEM IS NOT USED, JUS ON TSI1 MUST BE ADDED IN ORDER TO PROVIDE A 600 OHM TERMINATION.

NA	V -	PL DISABLE	FLAT AUDIO CONTROL	PL DISABLE CONTROL	NA	NA	PL INPUT	NA	REFLECT POWER	NON-SIMUL FUNCT TONE WINDOW CONTROL
		23 *		20						17
				2						
				21						
									8	
	8 *									
			7 *							
					5	6	7	2		
13				9 10	11 12		13 14			15
		13	26				29			
	6									
									J100 -13	

HOW TO READ CHART

1. This chart shows all interconnections made by the plating on both sides of the interconnect board and by wire jumpers.
2. All pin numbers in each vertical column are electrically common (interconnected by circuit board plating).
3. To trace interconnections from any starting point to all other common points proceed as follows:

Step 1. Find the module position or connector in the left hand column of the chart.

Step 2. Find the desired pin number. All pins of a specific connector are listed in the line that extends to the right.

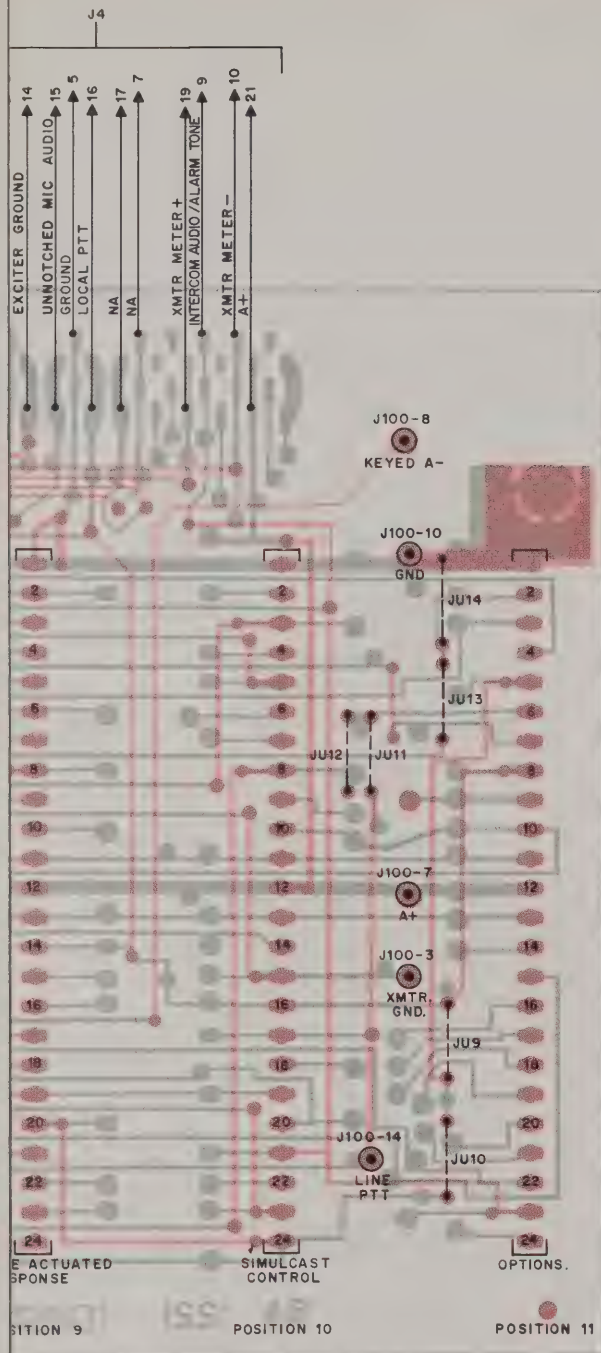
Step 3. Note the function of the desired pin. The function is listed at the top of the column in which the pin number appears. All other pins listed in the same function column are interconnected. For each entry in the function column, trace back to the left hand column to find the module or connector number. (See Example.)

Step 4. * equals function source.

Step 5. NA Not Assigned (Plating exists between points but not used.)

Example:

Station control module (position 1 pin 10) has a function of PTT Control which is interconnected to DC Transfer Module (position 2 pin 6), F1/PL Module (position 4 pin 23), Digital Modulator (position 7 pin 20), and Simulcast Control (position 10 pin 23).



NOTE: THESE CONNECTIONS ARE
MADE ON NON-SYNTHESIZED
STATIONS ONLY.

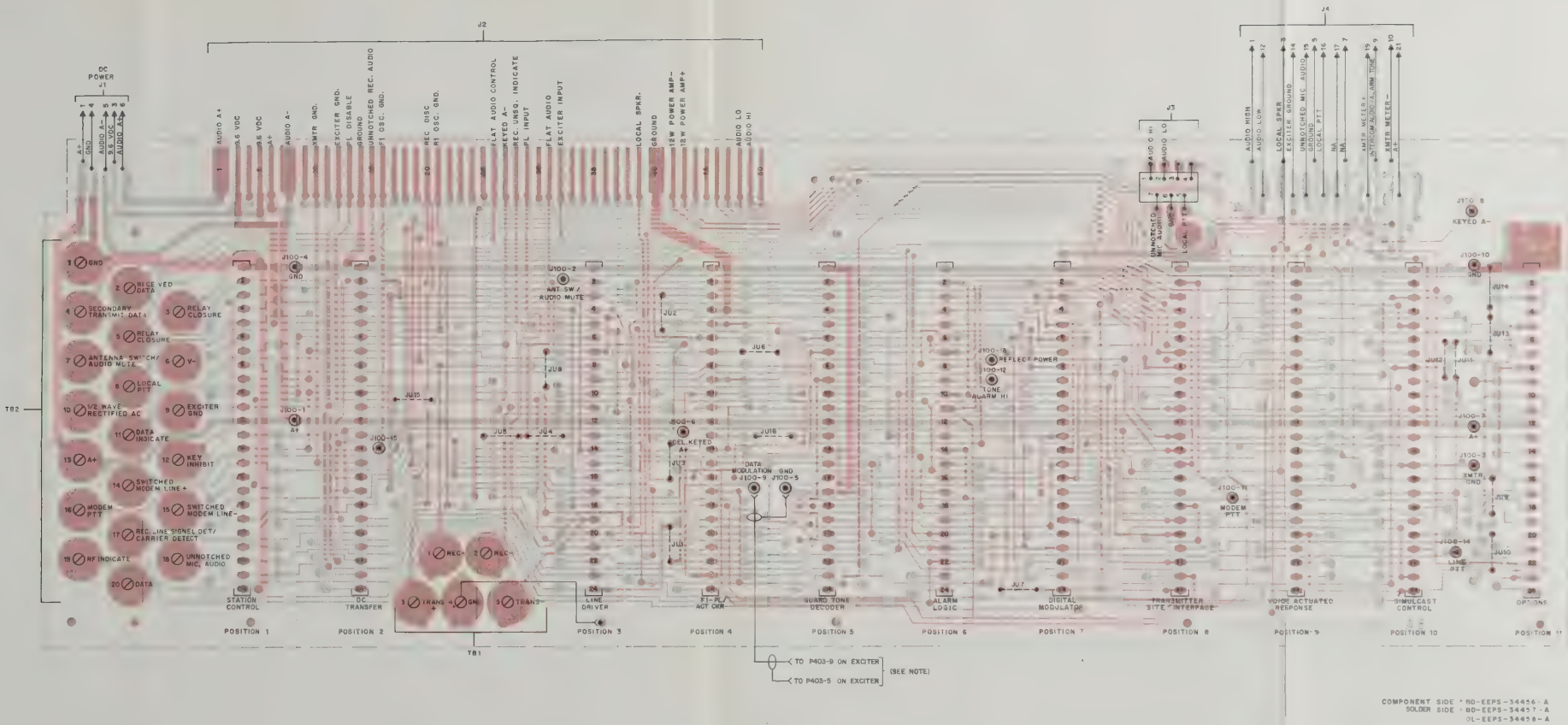
COMPONENT SIDE : BD-EEPS-34456-A
SOLDER SIDE : BD-EEPS-34457-A
OL-EEPS-34458-A

TRN5349A Non-Unified Remote Control
Board Circuit Board Detail
& Parts List
Motorola No. PEPS-34629-A
10/5/82 - V & G

MODULE NAME		POSITION	SIGNAL NAME																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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			A +	ALARM TONE 1	XMIT AUDIO MUTE	NOTCHED RECEIVER AUDIO	RECEIVER UNSQUELCHED INDICATE	ALARM TONE 2	LOCAL PTT	RECEIVER +	MODEM LINE +	MODEM LINE -	RECEIVER -	NOTCHED MIC AUDIO	ANTENNA SWITCH / AUDIO MUTE	TRANSMITTER LINE +	TRANSDORMER +	TRANSDORMER -	TRANSMITTER LINE -	LOCAL SPEAKER	PTT CONTROL	DELAYED KEYED A +	LINE PTT	MODEM PTT	LINE DISABLE	RECEIVER DISCRIMINATOR	AMPLIFIED RECEIVER DISCRIMINATOR	9.6V DC	F1 OSCILLATOR GND	TRANSMITTER GND	DC LINE DISABLE / GT DETECT	SECONDARY TRANSMIT DATA	RECEIVED DATA	BINARY ALARM	TS1 V-	1/2 WAVE RECTIFIED AC	SWITCHED MODEM LINE +	SWITCHED MODEM LINE -	RCVD LINE SIGNAL DET / CARRIER DET	GUARD TONE INHIBIT	DATA INDICATE	DATA	UNNOTCHED RECEIVED AUDIO	SWITCHED 9.6V DC	FUNCTION TONE HI	DECODER BIAS SWITCH	FUNCTION ENABLE	FUNCTION TONE WINDOW CONTROL	TONE ALARM HI	TONE ALARM LO	RELAY CLOSURE	RELAY CLOSURE	RT INDICATE	DATA MODULATION	EXCITER INPUT	FLAT AUDIO	RI OSCILLATOR GND	AUDIO A +	AUDIO A -	NA	NA	NA	AUTOMATIC DRIVE LIMITER OUTPUT	HIGH CURRENT A -	SIGNALING TONE	HIGH CURRENT A -	12 W POWER AMPLIFIER METER +	12 W POWER AMPLIFIER METER -	NA	GT DETECT	AUDIO HI	AUDIO LO	NA	V -	PL DISABLE	FLAT AUDIO CONTROL	PL DISABLE CONTROL	NA	NA	PL INPUT	NA	REFLECT POWER	NON-MUL FUNC TONE WINDOW CONTROL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
STATION CONTROL		1	24	12	4 *			5 *						2 *			3	4			11		3	7 *	8 *	9	10 *	13	14	15	19 *	21	22 *																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

parts list

TRN5349A Interconnect Board		Pl 7985-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
E1, 2, 3, 4	80-83029H01	spark, gap: 250 V, 151
J3	9-84207B01	connector, receptacle; female: 7 contact
		mechanical parts
	3-84462M01	SCREW, ma/min, insulator, 25 used
	29-83362G01	TERMINAL, 25 used
	29-84028H01	TERMINAL, lug, 764 used
	39-10184A-1	CONTACT, lug, 1 used
	26-84269C01	TERMINAL, contact, low profile, 13 used
	26-84269C02	TERMINAL, contact, high profile, 10 used



SHOWN FROM SOLDER SIDE
(REAR OF STATION)

COMPONENT SIDE * RD-EEPS-34456-A
SOLDER SIDE * BD-EEPS-34457-A
DL-EEPS-34459-A

TRN5349A Non-Unified Remote Control
Board Circuit Board Detail
& Parts List
Motorola No. PEPS-34629-A
10/5/82 - V & G

NOTES:

1. These connections are made on non-synthesized stations only.
2. CR1 and CR2 used with B84, C35, and C75 station models only.

Jumper Chart		
Jumper	Normal	Description
JU1	OUT	IN To Remove Xmit Notch
JU2	OUT	IN For Guard Tone only or Modem Key-Up
JU3	IN	OUT For Non-Preemphasized Xmit Audio
JU4	OUT	IN For Non-Flat Audio
JU5	OUT	IN When Not Using VAR Module
JU6	OUT	IN To Remove Rcvr Notch
JU7	OUT	IN For Non-Binary Paging Applications and Non-PL Link Applications

*TRN4860A Unified Remote Control
Board Circuit Board Detail
& Parts List
Motorola No. PEPS-34630-A
10/5/82 - V & G*

1. This chart shows all interconnections made by the plating on both sides of the Interconnect board and by wire jumpers.

2. All pin numbers in each vertical column are electrically common (interconnected by circuit board plating).

3. To trace interconnections from any starting point to all other common points proceed as follows:

Step 1. Find the module position or connector in the left hand column of the chart.

Step 2. Find the desired pin number. All pins of a specific connector are listed in the line that extends to the right.

Step 3. Note the function of the desired pin. The function is listed at the top of the column in which the pin number appears. All other pins listed in the same function column are interconnected. For each entry in the function column, trace back to the left hand column to find the module or connector number. (See Example.)

Step 4. \bullet equals function on source.

Step 5. NA Not Assigned (Plating exists between points but not used.)

Example:

Station control module (module position 2), pin 10 has a function of PTT Control, which is interconnected to DC Transfer Module (position 3) pin 6, F1-PL Module (position 5) pin 23, Digital Modulator (position 8) pin 20, and Simulcast Control Module (position 9) pin 23.

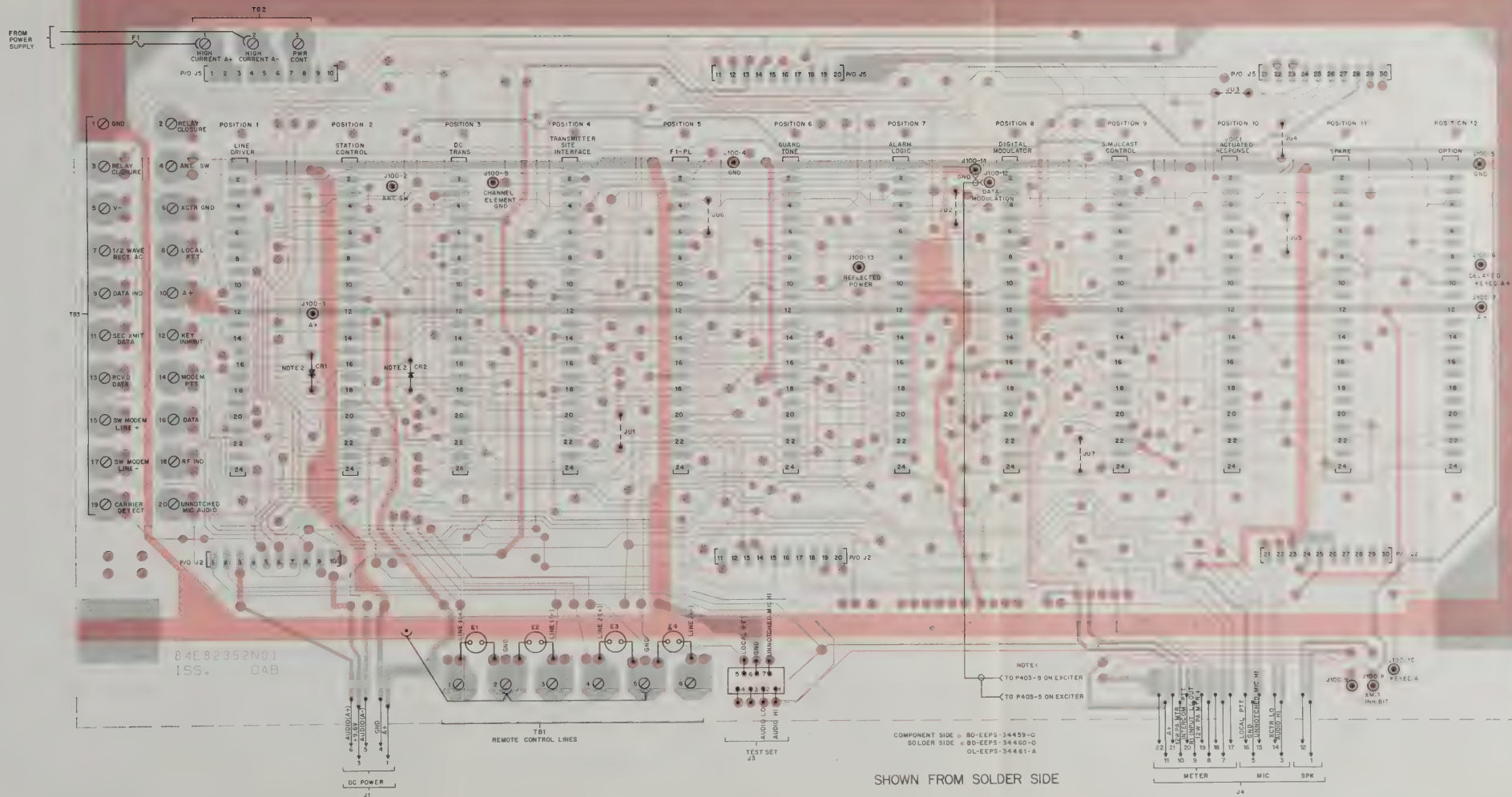
TCN1282A Unified Remote Control
Chassis Interconnect Chart
Motorola No. EEPS-34673-A
10/5/82 - V & G

parts list

TRN4860A Interconnect Board PL 7984 O

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
CR1-2	48-83654H01	diode (see note)
E1-2, 4	80-83029H01	spark gap 250 V - 15 A
J1	9-84207B01	connector receptacle female 7-contact
		mechanical parts
	1-84482M01	SCR W machine insulator 29 used
	29-81862G01	TERMINAL 29 used
	29-84429H09	TERMINAL plug 348 used
	29-81864H10	CONTACT plug 11 used
	29-84209G01	TERMINAL contact low profile 13 used
	29-84209C02	TERMINAL contact high profile 10 used

note: For optimum performance diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

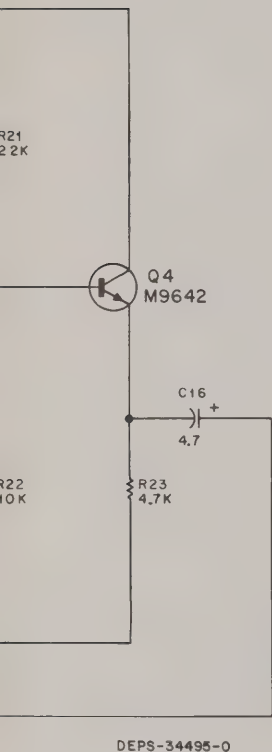


NOTES

- These connections are made on non-synthesized stations only.
- CR1 and CR2 used with B84 C35 and C75 station models only.

Jumper	Normal	Description
JU1	OUT	IN To Remove Xmit Notch
JU2	OUT	IN For Guard Tone Only or Modem Key Up
JU3	IN	OUT For Non Preemphasized Xmit Audio
JU4	OUT	IN For Non Flat Audio
JU5	OUT	IN When Not Using VARI Module
JU6	OUT	IN To Remove Ron Notch
JU7	OUT	IN For Non Binary Paging Applications and Non PL Line Applications

TRN4860A Unified Remote Control Board Circuit Board Detail & Parts List
Motorola No. PEPS-34630-A
10/5/82 - Y & G



parts list

TRN5348A Transmitter Flat Audio Board

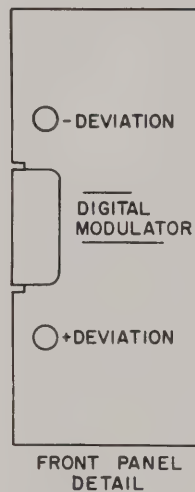
PL-7975-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed: $\mu\text{F} \pm 20\%$; 20 V; unless otherwise stated		
C1	23-84538G02	4.7
C2, 3	21-11015B13	.001 $\pm 10\%$; 100 V
C4	8-84637L48	.068 $\pm 5\%$; 100 V
C5	8-83813H14	.043 $\pm 5\%$; 50 V
C6	23-84538G02	4.7
C7	23-11013C07	10 $\pm 10\%$; 15 V
C8	23-84538G02	4.7
C9	8-84326A25	.0326 $\pm 2\%$; 50 V
C10	8-84326A18	.0098 $\pm 2\%$; 50 V
C11	8-84326A13	.0056 $\pm 2\%$; 50 V
C12	8-84326A30	.0045 $\pm 1\%$; 50 V
C13	23-84538G02	4.7
C14	23-11013C07	10 $\pm 10\%$; 15 V
C15, 16	23-84538G02	4.7
C17	21-11015B13	.001 $\pm 10\%$; 100 V
C18, 19	23-84538G02	4.7
transistor: (see note)		
Q1, 2, 3, 4	48-869642	NPN; type M9642
resistor, fixed: $\pm 5\%$; 1/4 W; unless otherwise stated		
R1	6-11009E91	56k
R2	6-11009E81	22k
R3	6-11009E55	1.8k
R4, 5	6-11009E63	3.9k
R6	6-11009E99	120k
R7	6-11009E93	68k
R8	6-11009E69	6.8k
R9	6-11009E49	1k
R10	6-11009E65	4.7k
R11	6-11009E67	5.6k
R12	6-11009E49	1k
R13	6-11009E69	6.8k
R14	6-11009E63	3.9k
R15	6-11009E99	120k
R16	6-11009E93	68k
R17	6-11009E69	6.8k
R18	6-11009E41	470
R19	6-11009E49	1k
R20	6-11009E65	4.7k
R21	6-11009E81	22k
R22	6-11009E73	10k
R23	6-11009E65	4.7k
R24	6-11009C51	1.2k
R25, 26	6-11009E97	100k
R27	6-11009D04	180k
R28	18-83311K11	variable; 25k
R29	6-11009C65	4.7k
R30	6-11009E01	10
integrated circuit: (see note)		
U1	51-82884L14	quad analog switch; IC CMOS
U2	1-80755D60	IDC hybrid
mechanical part		
	9-83697M01	RECEPTACLE, circuit board mount; 11 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

DIGITAL MODULATOR MODULE

MODEL TRN4856B



FUNCTION

This module accepts binary data from the Transmitter Site Interface (TSI) module and dc level shifts it to the proper voltages to deviate the transmitter carrier frequency ± 4 kHz corresponding to binary "1"s and "0"s.

The splatter filter attenuates high frequency energy from the binary data stream prior to application to the modulator. This limits the bandwidth of the transmitted signal per FCC regulations.

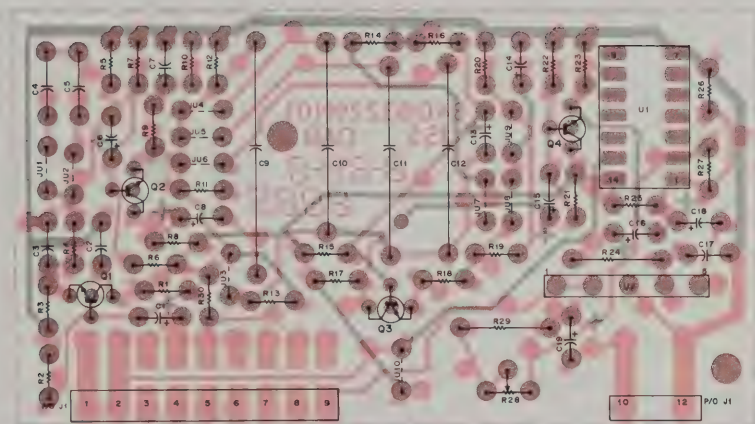
This module also provides gating of the binary data to the modulator stage in the transmitter, via the "Data Indicate" signal originating in the TSI module. The delayed keyed A+ from this module prevents the transmitter from un-keying during transitions between the normal mode and the binary mode of operation.

NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads.
2. Integrated circuits on this board are CMOS devices.
3. IC types and connections for this board are as follows:

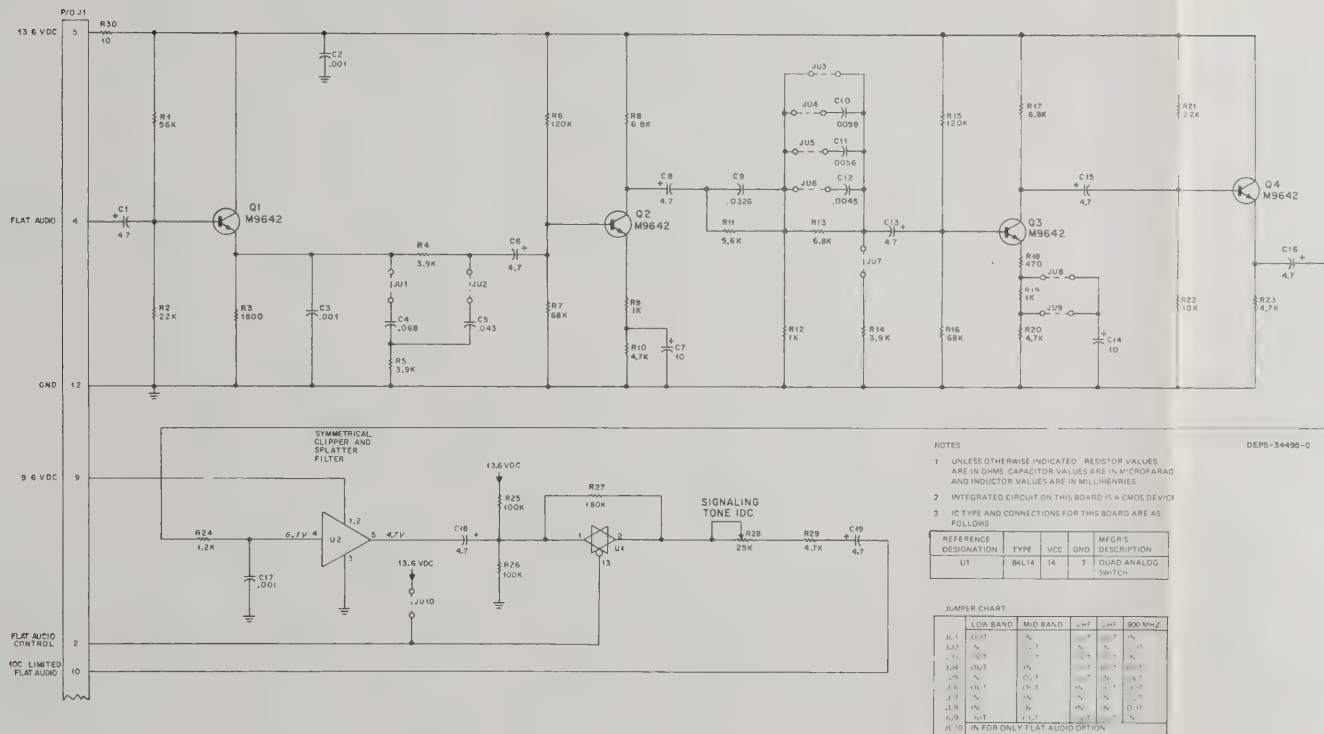
Reference Designation	Type	VCC	Gnd	Mfgr's Description
U1	29M08	4	11	Quad Op Amp
U2	84L14	14	7	Quad Analog Gate

TRN4856B Digital Modulator Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34632-A
10/5/82 - V & G



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE - BD CEPS-34496-0
SOLDER SIDE - BD CEPS-34497-0
OL CEPS-34498-0



- NOTES
- 1 UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS AND INDUCTOR VALUES ARE IN MILLIHENRIES
 - 2 INTEGRATED CIRCUIT ON THIS BOARD IS A CMOS DEVICE
 - 3 IC TYPE AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS

REFERENCE DESIGNATION	TYPE	VCC	GND	DESCRIPTION
U1	BA14	14	7	QUAD ANALOG SWITCH

JUMPER CHART	LOW BAND	MID BAND	1st	2nd	300 MHz
J1	1	1	1	1	1
J2	1	1	1	1	1
J3	1	1	1	1	1
J4	1	1	1	1	1
J5	1	1	1	1	1
J6	1	1	1	1	1
J7	1	1	1	1	1
J8	1	1	1	1	1
J9	1	1	1	1	1
J10	1	1	1	1	1

parts list

TRN5348A Transmitter Flat Audio Board PL 7975-0

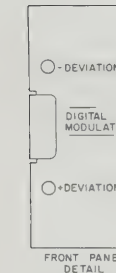
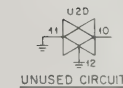
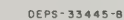
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	23.645MG02	Capacitor, fixed 0.02, 20 V
C2	21.1015B13	Capacitor, fixed 0.01, 20 V
C3	8.54037L48	Capacitor, fixed 0.01, 20 V
C4	21.1015B13	Capacitor, fixed 0.01, 20 V
C5	21.1015B13	Capacitor, fixed 0.01, 20 V
C6	21.1015B13	Capacitor, fixed 0.01, 20 V
C7	21.1015B13	Capacitor, fixed 0.01, 20 V
C8	21.1015B13	Capacitor, fixed 0.01, 20 V
C9	21.1015B13	Capacitor, fixed 0.01, 20 V
C10	21.1015B13	Capacitor, fixed 0.01, 20 V
C11	21.1015B13	Capacitor, fixed 0.01, 20 V
C12	21.1015B13	Capacitor, fixed 0.01, 20 V
C13	21.1015B13	Capacitor, fixed 0.01, 20 V
C14	21.1015B13	Capacitor, fixed 0.01, 20 V
C15	21.1015B13	Capacitor, fixed 0.01, 20 V
C16	21.1015B13	Capacitor, fixed 0.01, 20 V
C17	21.1015B13	Capacitor, fixed 0.01, 20 V
Q1, 2, 3, 4	48-889642	Transistor, NPN, type M9642
U1	BA14	QUAD ANALOG SWITCH
U2	383697M01	RECEPAC

NOTE: For optimum performance, Motorola part numbers should be used. Results must be ordered by Motorola part numbers.

MODEL TRN4856B



COMPONENT SIDE BD-DEPS-35226-0
SOLDER SIDE BD-DEPS-35227-0
OL-DEPS-35228-0



This module accepts binary data from the Transmitter Site Interface (TSI) module and dc level shifts it to the proper voltages to deviate the transmitter carrier frequency ± 4 kHz corresponding to binary "1"s and "0"s.

The splatter filter attenuates high frequency energy from the binary data stream prior to application to the modulator. This limits the bandwidth of the transmitted signal per FCC regulations.

This module also provides gating of the binary data to the modulator stage in the transmitter, via the "Data Indicate" signal originating in the TSI module. The delayed keyed A+ from this module prevents the transmitter from un-keying during transitions between the normal mode and the binary mode of operation.

NOTES

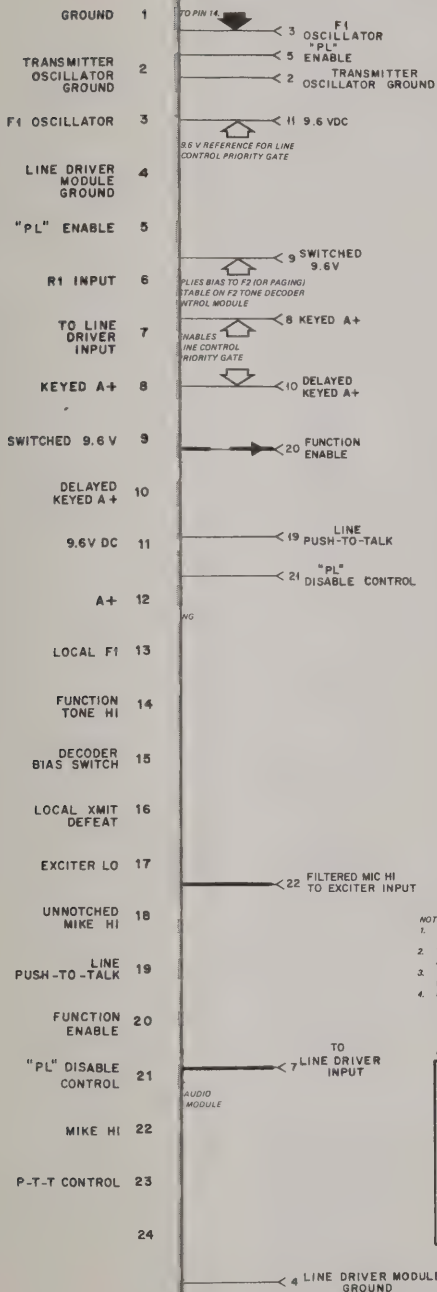
- 1 Unless otherwise indicated, resistor values are in ohms, capacitor values are in microfarads
- 2 Integrated circuits on this board are CMOS devices
- 3 IC types and connections for this board are as follows

Reference Designation	Type	VCC	Gnd	Mfr's Description
U1	29M08	4	11	Quad Op Amp
U2	84L14	14	7	Quad Analog Gate

TRN4856B Digital Modulator Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34632-A
10/5/82 - V & G

F1 & F1-PL TONE DECODER MODULES

MODELS TLN4638A F1-PL
TLN4658A F1
TLN5293A F1 (4F)
TLN5294A F1-PL (4F)

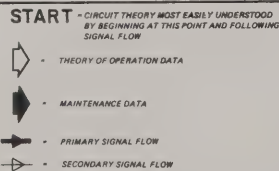


FUNCTION

TLN4658A F1 Control	Keys XMTR on F1.
TLN4638A F1-PL Control	Keys XMTR on F1 and PL disables RCVR.
TLN5293A F1 Control (4-Freq. Carrier Squelch Station)	Provides receive and transmit notch filters. Frequency selected on separate 4-Freq. control module (TLN5292A).
TLN5294A F1-PL Control (4-Freq. PL Squelch Station)	Provides receive and transmit notch filters and PL disables RCVR. Frequency selected on separate 4-Freq. control module (TLN5292A).

- NOTES:
1. J12 IS REMOVED WHEN MULTI-FREQUENCY AND PAGING TRANSMITTERS ARE USED
 2. TUNED CIRCUITS CONTAINING L1, L4, L2, AND L3 ARE FACTORY ADJUSTED TO THE REQUIRED FREQUENCY.
 3. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED.
 4. UNLESS OTHERWISE STATED, RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS.

LEGEND



PARTS LIST SHOWN ON BACK OF THIS PAGE

68P81016E19-N

10/5/82 - V & G

parts list

TRN4856B Digital Modulator Module

PL-7983-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2	8-83813H30	capacitor, fixed: uF; unless otherwise stated .0082 ± 10%; 100 V 270 pF ± 10%; 200 V 15 ± 15%; 25 V .05 ± 80-20%; 25 V
C3	21-82187B22	
C4	23-82783B24	
C5	21-82372C04	
CR1 thru 10	48-83654H01	diode: (see note) silicon
Q1	48-869643	transistor: (see note) PNP; type M9643 NPN; type M9642 NPN; type M9642 PNP; type M9643 NPN; type M9328
Q2	48-869642	
Q4	48-869642	
Q5	48-869643	
Q6	48-869328	
R1	6-11009C06	resistor, fixed: ± 5%; 1/4 W; unless otherwise stated 16 1k 47k 20k 10k variable; 10k 6.8k 1 meg. 2.4k 4.7k 10k 1.5k 18k 12k 10k 1.5k 1k 680
R2	6-11009C49	
R3, 6	6-11009C89	
R4	6-11009C80	
R5	6-11009C73	
R7, 8	18-84143N01	
R9, 10	6-11009C69	
R11	6-11009D22	
R12	6-11009C58	
R15	6-11009C65	
R16	6-11009C73	
R17	6-11009C53	
R18	6-11009C79	
R19	6-11009C75	
R20	6-11009C73	
R21	6-11009C53	
R22	6-11009C49	
R23	6-11009C45	
U1	51-83629M08	integrated circuit: (see note) quad operational amplifier quad analog gate
U2	51-82884L14	
VR1	48-82256C44	voltage regulator: Zener type; 7.5 V
mechanical parts		
	3-125790	SCREW, machine; 4-40 x 5/16"; 2 used
	45-83914G01	CARD, guide; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L13	PANEL, screened
	9-83697M01	RECEPTACLE, female; 24 used
	43-865080	BUSHING; 2 used

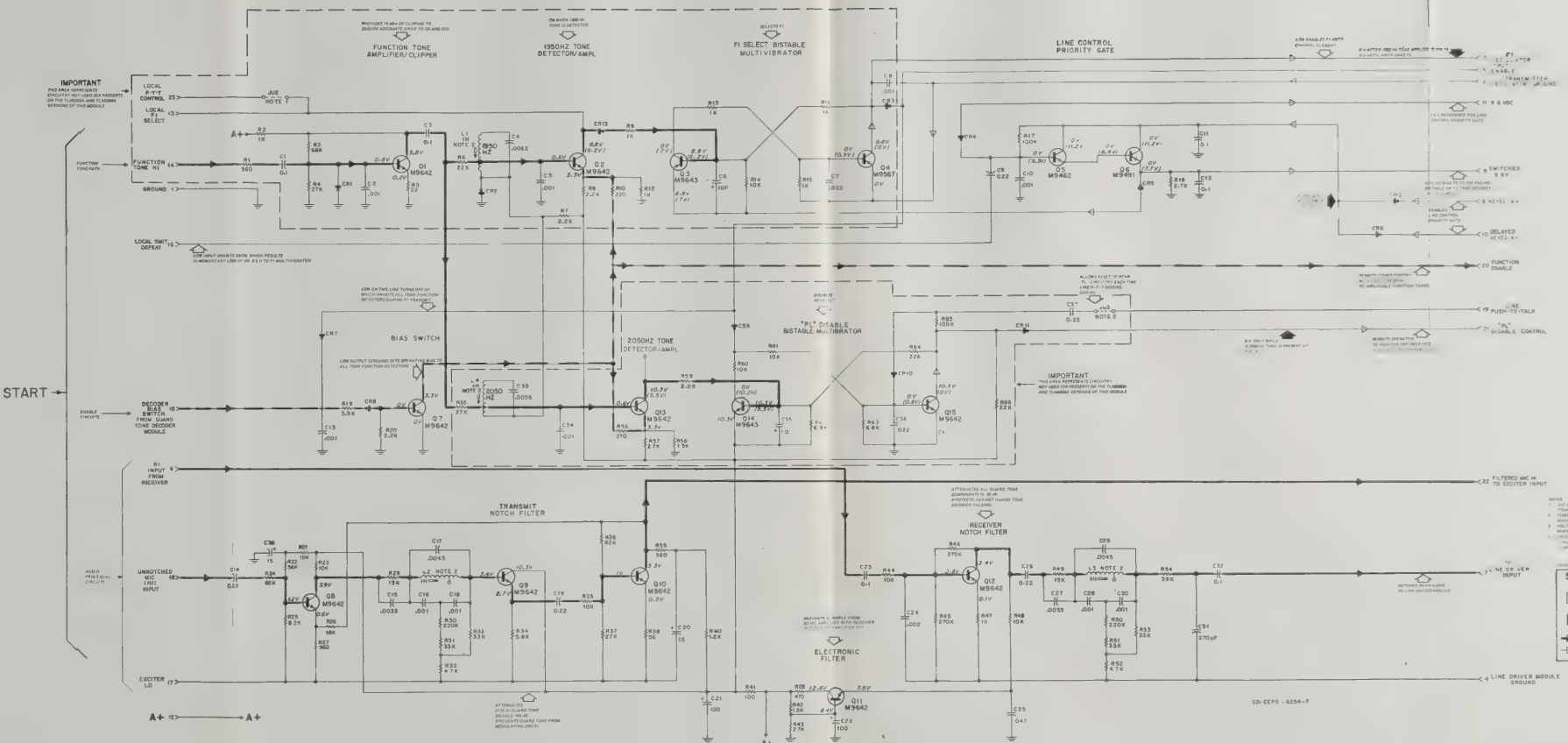
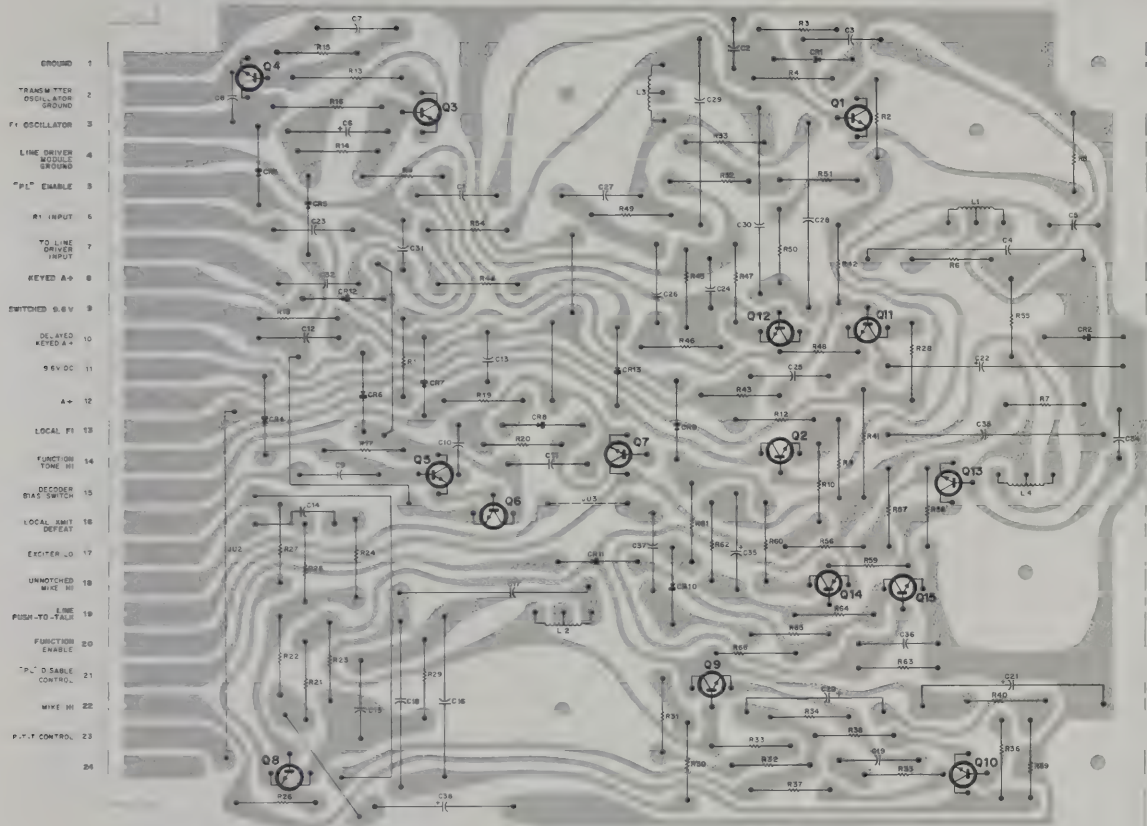
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

F1 & F1-PL TONE DECODER MODULES

MODELS TLN4638A F1-PL
TLN4658A F1
TLN5293A F1 (4F)
TLN5294A F1-PL (4F)

FUNCTION

TLN4658A F1 Control	Keys XMTR on F1
TLN4638A F1-PL Control	Keys XMTR on F1 and PL disables RCVR.
TLN5293A F1 Control (4-Freq Carrier Squelch Station)	Provides receive and transmit notch filters. Frequency selected on separate 4-Freq. control module (TLN5292A).
TLN5294A F1-PL Control (4-Freq. PL Squelch Station)	Provides receive and transmit notch filters and PL disable RCVR. Frequency selected on separate 4-Freq. control module (TLN5292A).



SHOWN FROM SOLDER SIDE

PARTS LIST SHOWN ON BACK OF THIS PAGE
68P81016E19-N
10/5/82 - V & G

F1 & F1-PL TONE DECODER MODULES

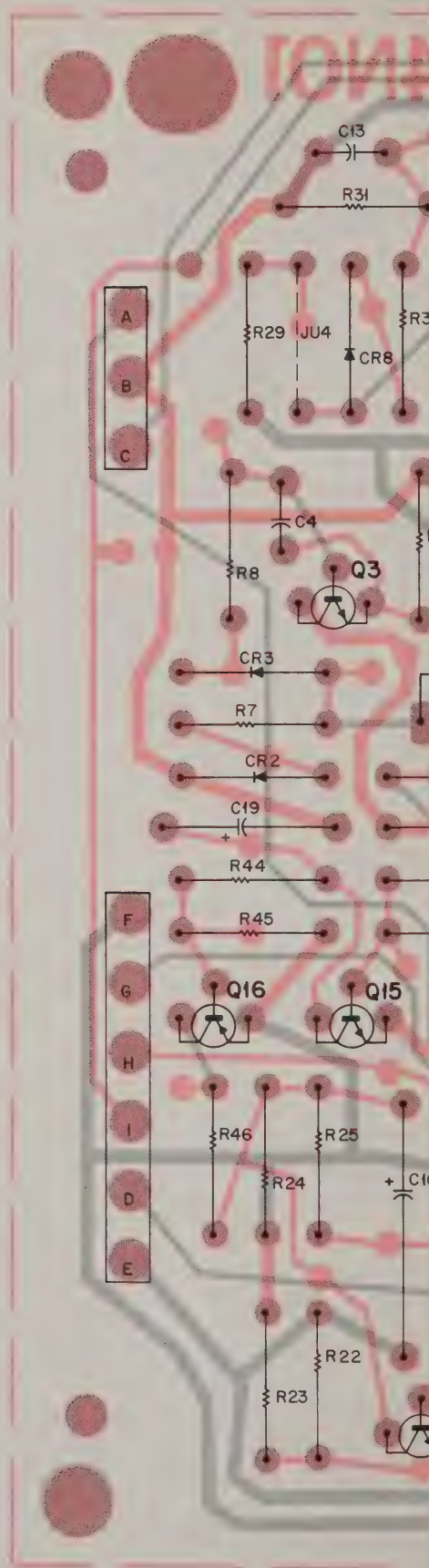
parts list

TLN4658A F1 Control Module
TLN4638A F1 Private-Line Control Module
TLN5293A F1 Control Module
TLN5294A F1 Private-Line Control Module
PL-1798-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V unless otherwise stated:
C1	8-82905G07	0.1
C2	21-82187B29	.001; 100 V
C3	8-82905G07	0.
C4	8-84326A14	.006 ± 2%
C5	21-82187B29	.001; 100 V
C6	23-82783B08	1 ± 20%; 35 V
C7	8-82905G02	.022
C8	21-82187B29	.001; 100 V
C9	8-82905G11	0.22
C10	21-82187B29	.001; 100 V
C11, 12	8-82905G07	0.1
C13, 14	21-82187B29	.001; 100 V
C15	8-82905G25	.0033
C16	8-82284C01	.001
C17	8-84326A30	.0045 ± 1%
C18	8-82284C01	.001
C19	8-82905G11	0.22
C20	23-865136	15 ± 20%; 25 V
C21	23-84669A19	100 + 150-10%; 20 V
C22	23-82601A25	100 + 150-10%; 20 V
C23	8-82905G07	0.1
C24	21-82187B27	.002; 100 V
C25	8-82905G03	.047
C26	8-82905G11	0.22
C27	8-82905G25	.0033
C28	8-82284C01	.001
C29	8-84326A30	.0045 ± 1%
C30	8-82284C01	.001
C31	21-82187B22	270 pF; 200 V
C32	8-82905G07	0.1
C33	8-84326A13	.0056 ± 2%
C34	21-82187B29	.001; 100 V
C35	23-82783B08	1 ± 20%; 35 V
C36	8-82905G02	.022
C37	8-82905G11	0.22
C38	23-865136	15 ± 20%; 25 V
CR1 thru 13	48-83654H01	semiconductor device, diode (see note) silicon
L1 thru 4	1V80702B11	reactor: (factory-adjusted) res. 40 ohms ± 10%; includes grounding clip
Q1, 2	48-869642	transistor: (see note)
Q3	48-869643	NPN; type M9642
Q4	48-869567	PNP; type M9643
Q5	48-869642	NPN; type M9567
Q6	48-869491	NPN; type M9642
Q7, 8, 9, 10, 11, 12, 13	48-869642	NPN; type M9642
Q14	48-869643	PNP; type M9643
Q15	48-869642	NPN; type M9642
		resistor, fixed; ± 5%; 1/4 W; unless otherwise stated:
R1	6-11009C43	560
R2	6-11009C49	1k
R3	6-11009C93	68k
R4	6-11009C83	27k
R5, 6	6-11009C81	22k
R7, 8	6-11009C57	2.2k
R9	6-11009C49	1k
R10	6-11009C33	220
R11		NOT USED
R12	6-11009C49	1k
R13	6-124A49	1k; 1/2 W
R14	6-11009C73	10k
R15	6-11009C49	1k
R16	6-124A49	1k; 1/2 W
R17	6-11009C97	100k
R18	6-11009C59	2.7k
R19	6-11009C63	3.9k
R20	6-11009C57	2.2k
R21	6-11009C79	18k
R22	6-11009C91	56k
R23	6-11009C73	10k
R24	6-11009C95	82k
R25	6-11009C71	8.2k
R26	6-11009C79	18k
R27	6-11009C43	560
R28	6-11009C41	470
R29	6-11009C77	15k
R30	6-11009D06	220k
R31	6-11009C85	33k
R32	6-11009C65	4.7k
R33	6-11009C85	33k
R34	6-11009C67	5.6k
R35	6-11009C73	10k
R36	6-11009C95	82k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R37	6-11009C83	27k
R38	6-11009C19	56
R39	6-11009C43	560
R40	6-11009C51	1.2k
R41	6-124A25	100; 1/2 W
R42	6-11009C53	1.5k
R43	6-11009C59	2.7k
R44	6-11009C73	10k
R45	6-11009D08	270k
R46	6-124B08	270k ± 5%
R47	6-11009C49	1k
R48	6-11009C73	10k
R49	6-11009C77	15k
R50	6-11009D06	220k
R51	6-11009C85	33k
R52	6-11009C65	4.7k
R53	6-11009C85	33k
R54	6-11009C87	39k
R55	6-11009C83	27k
R56	6-11009C35	270
R57	6-11009C59	2.7k
R58	6-11009C53	1.5k
R59	6-11009C57	2.2k
R60, 61	6-11009C73	10k
R62, 63	6-11009C69	6.8k
R64	6-11009C81	22k
R65	6-11009C97	100k
R66	6-11009C81	22k

note: Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



TRN4853A Transmitter Site Interface
 Module Circuit Board Detail, Schematic Diagram
 & Parts List
 Motorola No. PEPS-34633-A
 (Sheet 1 of 2)
 10/5/82 - V & G

TRANSMITTER SITE INTERFACE MODULE (TSI)

MODEL TRN4853A

FUNCTION

This module accepts binary data from the modem and dc level shifts it to the proper logic levels required by the digital modulator module for binary paging. The T.S.I. module provides a modem PTT function in conjunction with the carrier detect signal and the binary output data from the modem. The modem PTT function is used to key the station in the binary mode of operation. The modem PTT signal is also used to inhibit the guard tone decoder allowing the station to go into the FSK-NRZ (frequency shift keying - non return to zero) mode required for binary signaling.

A relay and associated driver control circuitry are contained in this module to switch the modem off line until the station has received the proper tone remote signaling commands. This prevents modem falsing and subsequent transmitter key up falsing due to telephone line or radio link noise. It also prevents the modem from being on the line during line PTT.

istor values are in ohms and capacitor values

in the following chart.

Normal Usage

detect key-up)

data)

data)

on)

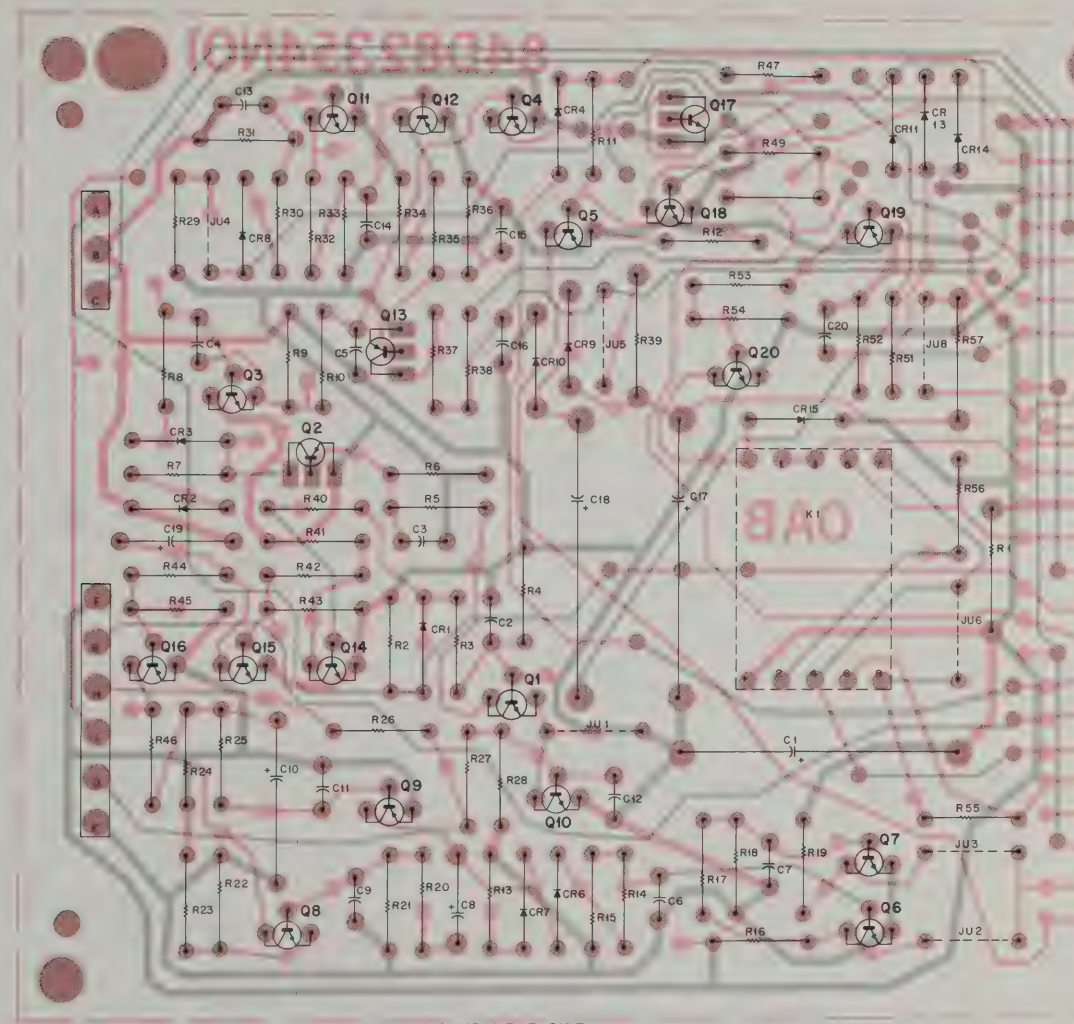
ve voltage module is used)

n is removed)

ve voltage module is used)

*TRN4853A Transmitter Site Interface
Module Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34633-A
(Sheet 2 of 2)
10/5/82 - V & G*

TRN4853A Transmitter Site Interface
Module Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34633-A
(Sheet 1 of 2)
10/5/82 - V & G



SHOWN FROM COMPONENT SIDE

SOLDER SIDE - BD DEPS 33439-0
COMPONENT SIDE - BD DEPS 33438-0
OL DEPS 33437-0

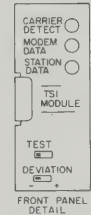
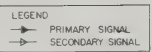
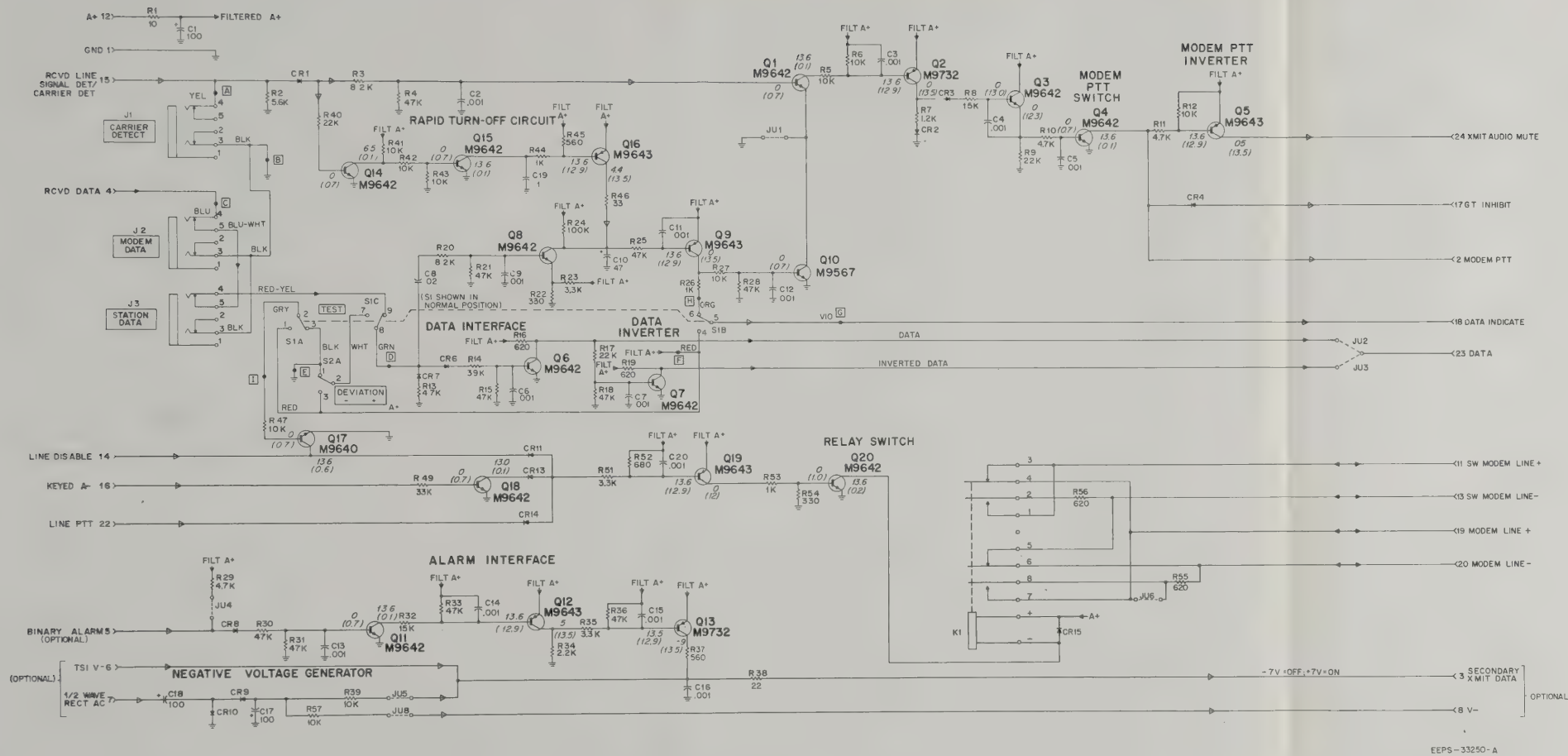
parts list

TRN4853A Transmitter Site Interface Module			PL-7685 A
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
C1	23-8901A25	capacitor, fixed: uF ± 10%; 100 V;	
C2 thru 5	21-11015013	unless otherwise stated	
C6, 7	21-11015813	100 ± 150 10%; 20 V	
C8	8-82905023	.001	
C9	21-11015813	.001	
C10	23-82783837	47 ± 20% 25 V	
C11 thru 16	21-11015813	.001	
C17, 18	23-82807106	100 ± 150 10%; 35 V	
C19	23-84762H06	1.0 ± 20% 35 V	
C20	21-11015813	.001	
CR1 thru 4	48-83654H01	diode: (see note)	
CR5 thru 8	48-83654H01	silicon	
CR9, 10	48-82466H13	silicon	
CR11	48-83654H01	silicon	
CR13, 14, 15	48-83654H01	silicon	
J1, 2, 3	9-83073L02	connector, receptacle:	
		jack, phone	
K1	80-82617M06	relay, reed	
		15.4 V; coil res. 240 ohms ± 10%	
Q1	48-899642	transistor: (see note)	
Q2	48-899732	NPN; type M9642	
Q3, 4	48-899642	NPN; type M9642	
Q5	48-899643	PNP; type M9643	
Q6, 7, 8	48-899642	NPN; type M9642	
Q9	48-899643	PNP; type M9643	
Q10	48-899642	NPN; type M9642	
Q11	48-899642	NPN; type M9642	
Q12	48-899643	PNP; type M9643	
Q13	48-899732	PNP; type M9632	
Q14, 15	48-899642	NPN; type M9642	
Q16	48-899643	PNP; type M9643	
Q17	48-899640	NPN; type M9640	
Q18	48-899642	NPN; type M9642	
Q19	48-899643	PNP; type M9643	
Q20	48-899642	NPN; type M9642	
R1	6-125C01	resistor, fixed: ± 5%; 1/4 W;	
R2	6-11009C67	10 ± 10%; 1/2 W	
R3	6-11009C71	5.6k	
R4	6-11009C89	8.2k	
R5, 6	6-11009C73	47k	
R7	6-11009C51	10k	
R8	6-11009C77	1.2k	
R9	6-11009C81	15k	
R10, 11	6-11009C05	22k	
R12	6-11009C73	4.7k	
R13	6-11009C65	10k	
R14	6-11009C63	4.7k	
R15	6-11009C89	3.9k	
R16	6-11009C44	47k	
R17	6-11009C81	820	
R18	6-11009C89	22k	
R19	6-11009C44	47k	
R20	6-11009C71	820	
R21	6-11009C89	8.2k	
R22	6-11009C37	47k	
R23	6-11009C61	330	
R24	6-11009C87	3.3k	
R25	6-11009C89	100k	
R26	6-11009C49	47k	
R27	6-11009C73	1k	
R28	6-11009C89	10k	
R29	6-11009C85	47k	
R30, 31	6-11009C89	4.7k	
R32	6-11009C77	15k	
R33	6-11009C89	47k	
R34	6-11009C37	2.2k	
R35	6-11009C61	3.3k	
R36	6-11009C89	47k	
R37	6-11009C43	560	
R38	6-11009C09	22	
R39	6-125A73	10k; 1/2 W	
R40	6-11009C81	22k	
R41 thru 43	6-11009C73	10k	
R44	6-11009C49	1k	
R45	6-11009C43	560	
R46	6-11009C13	33	
R47	6-11009C73	10k	
R48		NOT USED	
R49	6-11009C85	33k	
R50	6-11009C51	3.3k	
R51	6-11009C45	660	
R52	6-11009C49	1k	
R53	6-11009C37	330	
R54	6-11009C44	820	
R55, 56	6-125A73	10k; 1/2 W	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
S1	40-83204B03	switch, slide
S2	40-83204B01	3 pdt dptd
	3-125790	SCREW, machine: 4-40 x 5/16"; 2 used
	43-83914G01	GUIDE, card: 2 used
	46-84703E01	GUIDE, circuit board
	1-80761D46	PANEL, riveted (includes ref. item S1, S2)
	9-83074M01	RECEPTACLE, board mounting: 24 used
	43-865080	BUSHING, threaded: 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers

TRANSMITTER SITE INTERFACE
MODULE (TSI)
MODEL TRN4853A



MODULE FRONT PANEL TOP



REAR VIEW

NOTES

1. Unless specified otherwise, resistor values are in ohms and capacitor values are in microfarads.
2. Jumper configurations are given in the following chart.

Jumper	Normal Usage
JU1	Out (In for signal detect key-up)
JU2	In (Out for inverted data)
JU3	Out (In for inverted data)
JU4	In (Out for verification)
JU5	In (Out when negative voltage module is used)
JU6	Out (In when modem is removed)
JU7	NOT USED
JU8	In (Out when negative voltage module is used)

FUNCTION

This module accepts binary data from the modem and dc level shifts it to the proper logic levels required by the digital modulator module for binary paging. The T.S.I. module provides a modem PTT function in conjunction with the carrier detect signal and the binary output data from the modem. The modem PTT function is used to key the station in the binary mode of operation. The modem PTT signal is also used to inhibit the guard tone decoder allowing the station to go into the FSK-NRZ (frequency shift keying - non return to zero) mode required for binary signaling.

A relay and associated driver control circuitry are contained in this module to switch the modem off line until the station has received the proper tone remote signaling commands. This prevents modem falsing and subsequent transmitter key up falsing due to telephone line or radio link noise. It also prevents the modem from being on the line during line PTT.

TRN4853A Transmitter Site Interface
Module Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34633-A
(Sheet 2 of 2)
10/5/82 - V & G

DESCRIPTION
150k
10k
4.7k
switch, slide:
dpt
transformer, line driver:
pins #7 and 9 dc resist. = 110 ohms
pins #1 and 2 dc resist. = 25 ohms
pins #3 and 4 dc resist. = 25 ohms
pins #11 and 12 dc resist. = 250 ohms
pins #7 and 9 dc resist. = 250 ohms
pins #1 and 2 dc resist. = 25 ohms
pins #3 and 4 dc resist. = 25 ohms
pins #11 and 12 dc resist. = 250 ohms
referenced items
CIRCUIT BOARD
includes:
RECEPTACLE, board mounting; 24 used
BUSHING, threaded; 2 used
PANEL, riveted
includes: ref. items S1
PANEL
WASHER, insulated
SCREW, tapping; 4-40 x 5/16"; 2 used
SCREW, tapping; 4-40 x 5/16"; 2 used
BRACKET, panel
STRAP, tie; 3 used
CARD, guide; 2 used
GUIDE, circuit board
des, transistors, and integrated circuits must

LINE DRIVER MODULE

MODEL TRN4859A

FUNCTION

This module amplifies and gates incoming 600-ohm line audio to the transmitter. It also routes incoming modem tones for binary paging applications to the modem via a relay in the transmitter site interface module (TSI). The line driver also receives audio from an optional monitor or link receiver, gates and amplifies it so it is capable of driving a 600-ohm telephone line.

When the station has local speaker monitoring capability, a front panel mounted switch on the line driver selects either received or transmit audio which is routed to the local speaker. An amplifier circuit is located in both receive and transmit audio paths to drive the local speaker final amplifier circuits.

The test jacks located on the front panel facilitate level settings. Three jacks are for receiver line audio measurements and an additional set of three jacks are for transmit line audio measurements. One bridging and two terminating jacks are provided in each set of three jacks mentioned above. An additional test jack labeled XCTR LEVEL is provided for injecting a test tone directly into the exciter audio circuitry for Instantaneous Deviation Control (IDC) setting.

Jumpers in the module provide for either a 4-wire configuration (receive audio on a separate phone line from transmit audio) or a 2-wire configuration (receive and transmit audio combined on the same telephone line).

Resistor values are in ohms and capacitor values

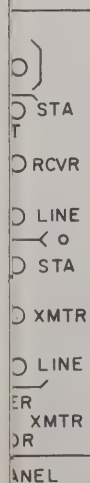
) indicate signal input levels for ac voltage (V). For all other cases, the signal generator is set to the level indicated in the following chart:

For out for 4-wire control.

For special applications.
For special applications.
For special applications.
RCVR line levels \leq 10 dBm.

Used in binary stations.

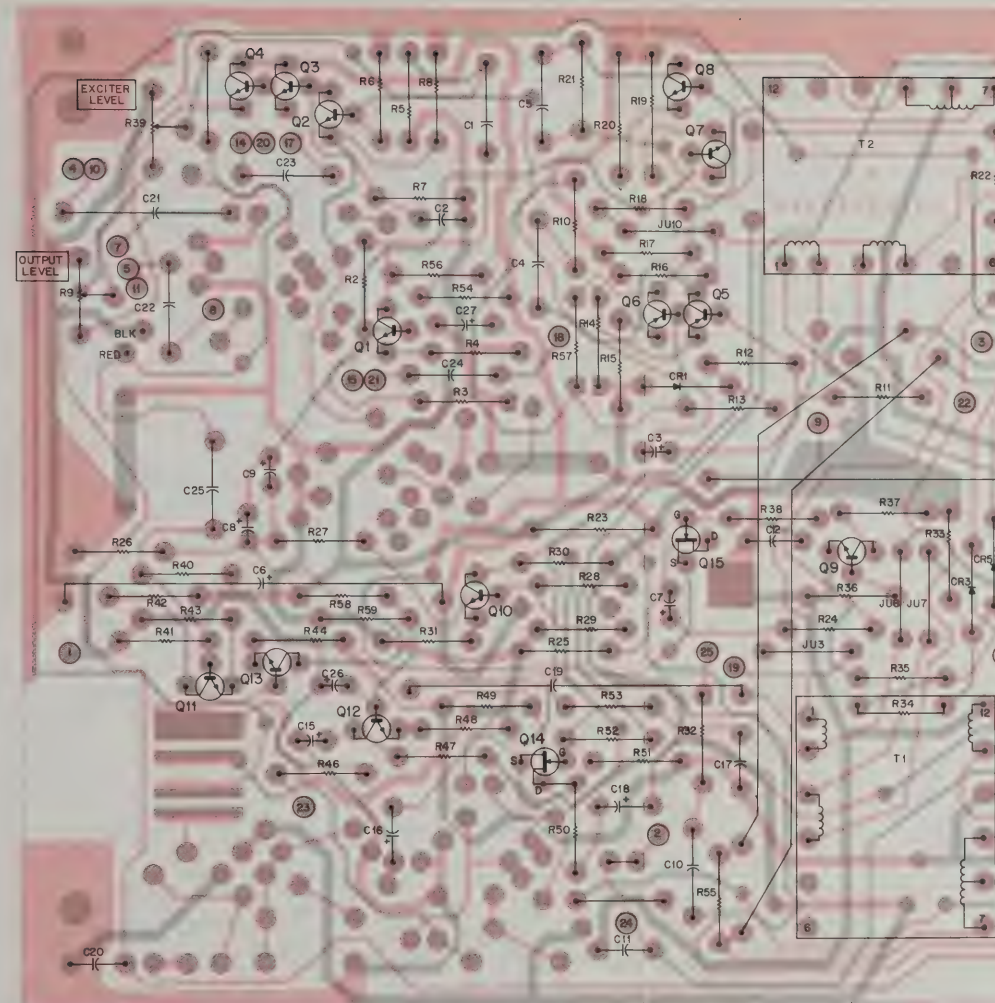
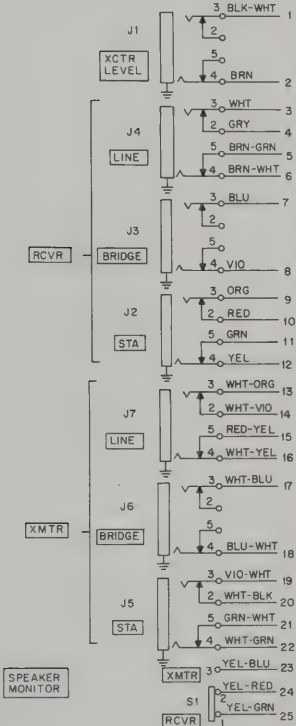
Guard tone filters when injecting a 1 V rms signal for measurement.



*TRN4859A Line Driver Module
Circuit Board Detail, Schematic
Diagram & Parts List
Motorola No. PEPS-34634-A
(Sheet 2 of 2)*

10/5/82 - V & G

NOTE
WIRES FROM FRONT PANEL JACKS
ARE ROUTED TO CORRESPONDING POINTS
ON THE BOARD (1, 2, ETC)



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE BD DEPS-34478-0
SOLDER SIDE BD DEPS-34477-0
OL DEPS-33112-0

parts list

TRN4859A Line Driver Board PL 7540-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-82905G11	capacitor, fixed, uF : 10%, 50 V
C2	21-82187B07	unless otherwise stated
C3	23-84538G01	470 pF 500 V
C4	8-82905G11	1.0 - 20%, 35V
C5	8-82905G01	0.1
C6	23-83210A19	500 20 V
C7, 8, 9	23-84538G01	1.0 - 20%, 35 V
C10	8-82905G11	0.22
C11	21-82428B27	0047 100 V
C12	21-82187B20	0.01, 100 V
C13, 14	NOT USED	
C15	23-84538G01	1.0 - 20%, 35 V
C16	23-84538G04	15 - 20%, 20 V
C17	21-82187B20	001, 100 V
C18	23-84538G04	15 - 20%, 20 V
C19	8-863305	2.0 200 V
C20	21-82187B20	001, 100 V
C21	8-82317B01	0.1, 100 V
C22, 23, 24	21-82373C01	0.1
C25	23-84538G04	15 - 20%, 20 V
C26	23-84538G01	1.0 - 35 V
C27	23-84538G04	15 - 20%, 20 V
CR1 thru 4	48-83654H01	diode, (see note) silicon
J1 thru 7	9-83073L02	connector, receptacle phono
Q1	48-889642	transistor, (see note)
Q2	48-889539	NPN, type M9542
Q3, 4	48-889642	NPN, type M9642
Q5, 6	48-889643	PNP, type M9643
Q7, 8, 9	48-889642	NPN, type M9642
Q10, 11	48-889594	NPN, type M9594
Q12	48-889642	NPN, type M9642
Q13	48-889594	NPN, type M9594
Q14, 15	48-889660	FET, type M9660
R1	6-11009C99	resistor, fixed, 5%, 1/4 W
R2	6-11009C02	unless otherwise stated
R3	6-11009C89	120k
R4	6-11009C33	150k
R5	6-11009C09	47k
R6	6-11009C89	220
R7	6-11009C65	120k
R8	6-11009C61	47k
R9	18-83083G09	4.7k
R10	6-11009C83	3.3k
R11	6-11009C02	var 1k
R12, 13	6-11009C79	27k
R14, 15	6-11009C41	150k
R16, 17	6-11009C57	18k
R18	6-11009C42	470
R19, 20	6-125A31	2.2k
R21	6-11009C51	510
R22	6-11009C91	180, 1/2 W
R23	6-125A01	1.2k
R24	6-11009C77	56k
R25	6-11009C22	10, 1/2 W
R26	6-11009C89	15k
R27	6-11009C71	1.0 meg
R28	6-11009C97	47k
R29	6-11009C73	8.2k
R30	6-11009C49	100k
R31	6-11009C25	1k
R32	6-11009C55	1.8k
R33	6-11009C81	47k
R34	6-11009C53	1.5k
R35	6-11009C73	10k
R36	6-11009C65	4.7k
R37	6-11009C81	47k
R38	6-11009C22	1.0 meg
R39	18-83083G16	var 25k
R40	6-11009C95	82k
R41	6-11009C73	10k
R42	6-11009C65	4.7k
R43	6-11009C41	470
R44	6-11009C43	560
R45	NOT USED	
R46	6-11009C55	1.8k
R47	6-11009C45	680
R48	6-11009C43	560
R49	6-11009D14	470k
R50	6-11009C13	33
R51	6-11009C65	4.7k
R52	6-11009C73	10k
R53	6-11009D14	470k
R54	6-11009C37	330
R55	6-11009C44	820
R56	6-11009C65	4.7k

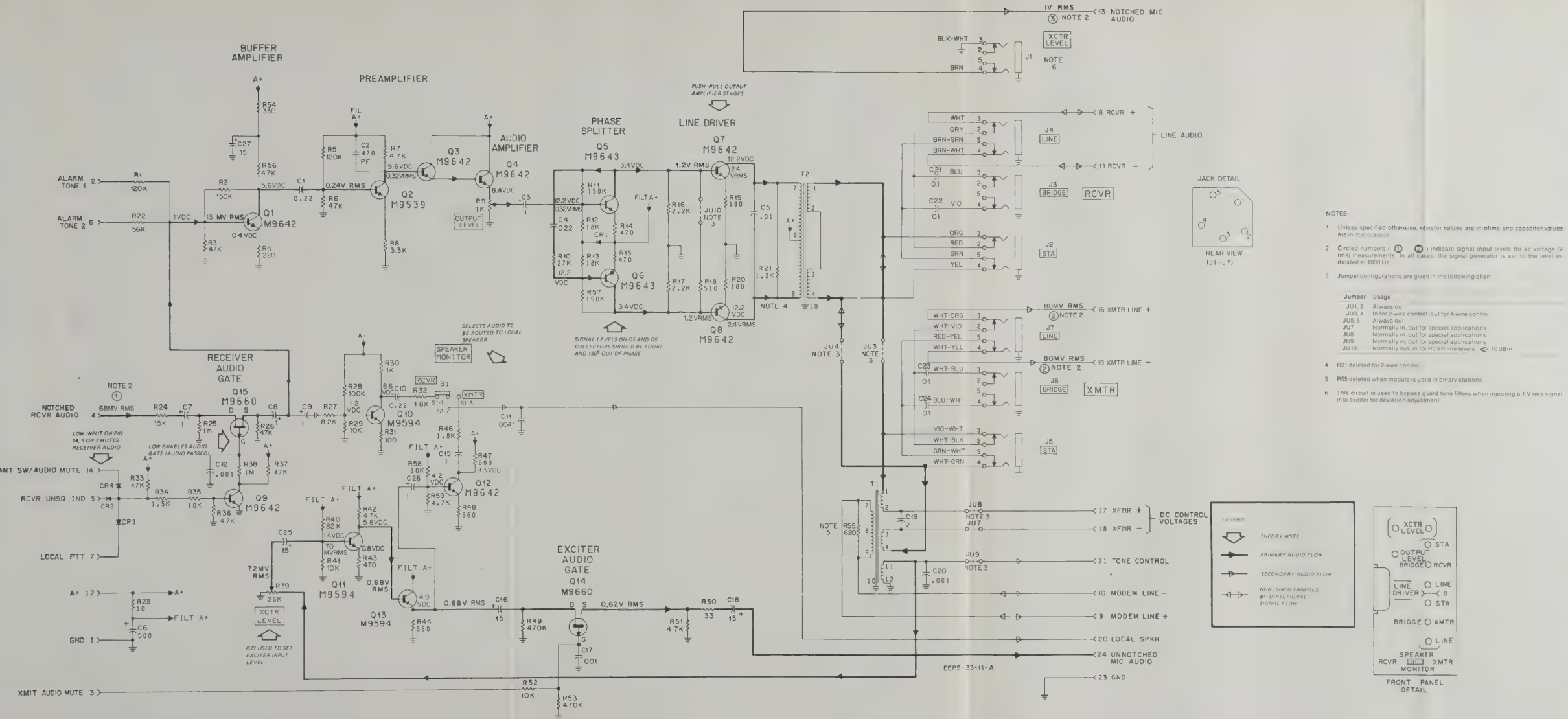
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R57	6-11009D02	capacitor, fixed, uF : 10%, 50 V
R58	6-11009C73	unless otherwise stated
R59	6-11009C65	470 pF 500 V
S1	40-83204B01	switch, slide
T1	25-83036L02	transformer, line driver
T2	25-83036L01	pins #7 and 9 dc resist = 110 ohms pins #1 and 2 dc resist = 25 ohms pins #3 and 4 dc resist = 25 ohms pins #11 and 12 dc resist = 250 ohms pins #7 and 9 dc resist = 250 ohms pins #1 and 2 dc resist = 25 ohms pins #3 and 4 dc resist = 25 ohms pins #11 and 12 dc resist = 250 ohms

non-referenced items
1 80761D42 CIRCUIT BOARD
9 83697M01 i-modes
43 865080 RECEPTACLE, board mounting, 24 used
1 80761D40 BUSHING, threaded, 2 used
PANEL, riveted
i-modes ref. items S1
64-83163L09 PANEL
4-82418B97 WASHER, insulated
3 134184 SCREW, tapping, 4-40 x 5/16, 2 used
3 125790 SCREW, tapping, 4-40 x 5/16, 2 used
7 83164L01 BRACKET, panel
42 10217A02 STRAP, tie, 3 used
45-83914D01 CARD guide, 2 used
46-84703E01 GUIDE, circuit board

note: For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.

LINE DRIVER MODULE

MODEL TRN4859A



FUNCTION

This module amplifies and gates incoming 600-ohm line audio to the transmitter. It also routes incoming modem tones for binary paging applications to the modem via a relay in the transmitter site interface module (TSI). The line driver also receives audio from an optional monitor or link receiver, gates and amplifies it so it is capable of driving a 600-ohm telephone line.

When the station has local speaker monitoring capability, a front panel mounted switch on the line driver selects either received or transmit audio which is routed to the local speaker. An amplifier circuit is located in both receive and transmit audio paths to drive the local speaker final amplifier circuits.

The test jacks located on the front panel facilitate level settings. Three jacks are for receiver line audio measurements and an additional set of three jacks are for transmit line audio measurements. One bridging and two terminating jacks are provided in each set of three jacks mentioned above. An additional test jack labeled XCTR LEVEL is provided for injecting a test tone directly into the exciter audio circuitry for instantaneous Deviation Control (IDC) setting.

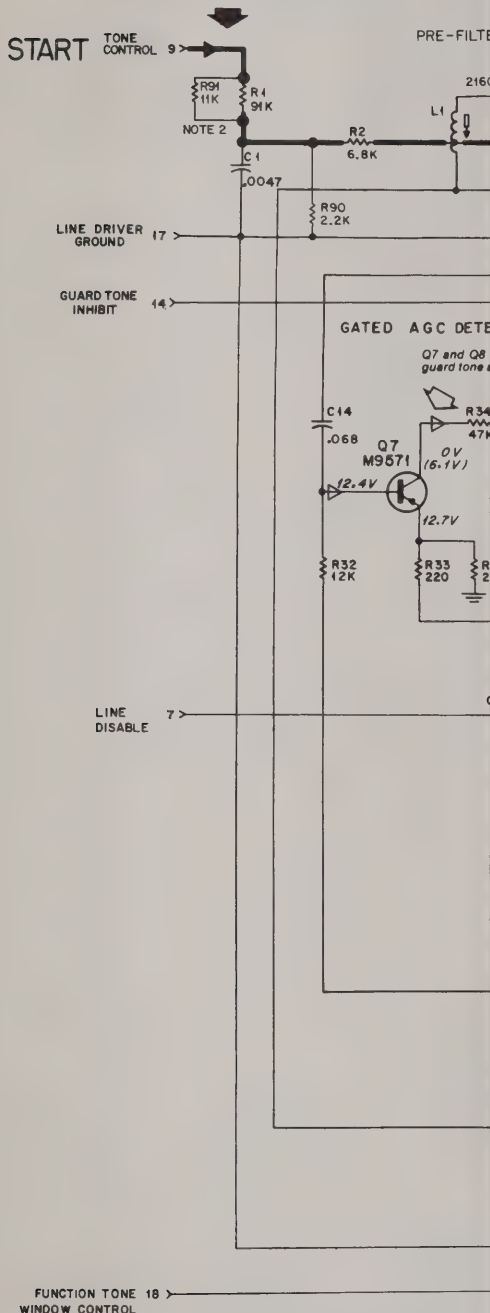
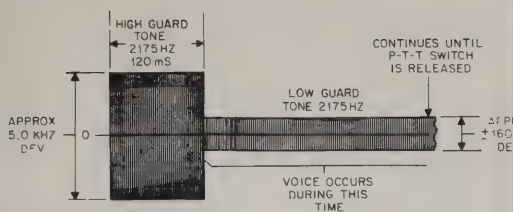
Jumpers in the module provide for either a 4-wire configuration (receive audio on a separate phone line from transmit audio) or a 2-wire configuration (receive and transmit audio combined on the same telephone line).

TRN4859A Line Driver Module
Circuit Board Detail, Schematic
Diagram & Parts List
Motorola No. PEPS-34634-A
(Sheet 2 of 2)
10/5/82 - V & G

LINE DRIVER MODULE

GUARD TONE DECODER MODULE

MODEL TLN2376A



FUNCTION

This module detects 2175 Hz guard tone and converts it into line PTT signal which is required for remote key up of the transmitter. It also amplifies received function tones and distributes them to other function tone decoders in the station (for example the 1950 Hz tone detector in the F1 Control Module).

The automatic gain control circuitry in this module adjusts guard tone and function tone levels for proper operation of tone decoding circuitry independent of input levels to the remote control chassis of the station.

The activity detector stages sense the loss of low level guard tone. The fast turn off circuitry quickly turns off the line PTT signal so the station can rapidly enter the binary mode of operation or un-key the transmitter depending on the commands sent to the station.

This module also has a switchable bandpass filter to allow only the guard tone frequency to enter the module to provide falsing protection. After detection of guard tone, this filter is switched out during the time function commands are sent to the station and during this period, the tone decoders are enabled. This allows function tones of various frequencies to be amplified in the guard tone decoder prior to being sent to the respective function tone decoders. The switching of the filter is controlled by circuitry in the TRN4854A Station Control Module.

Model Complement

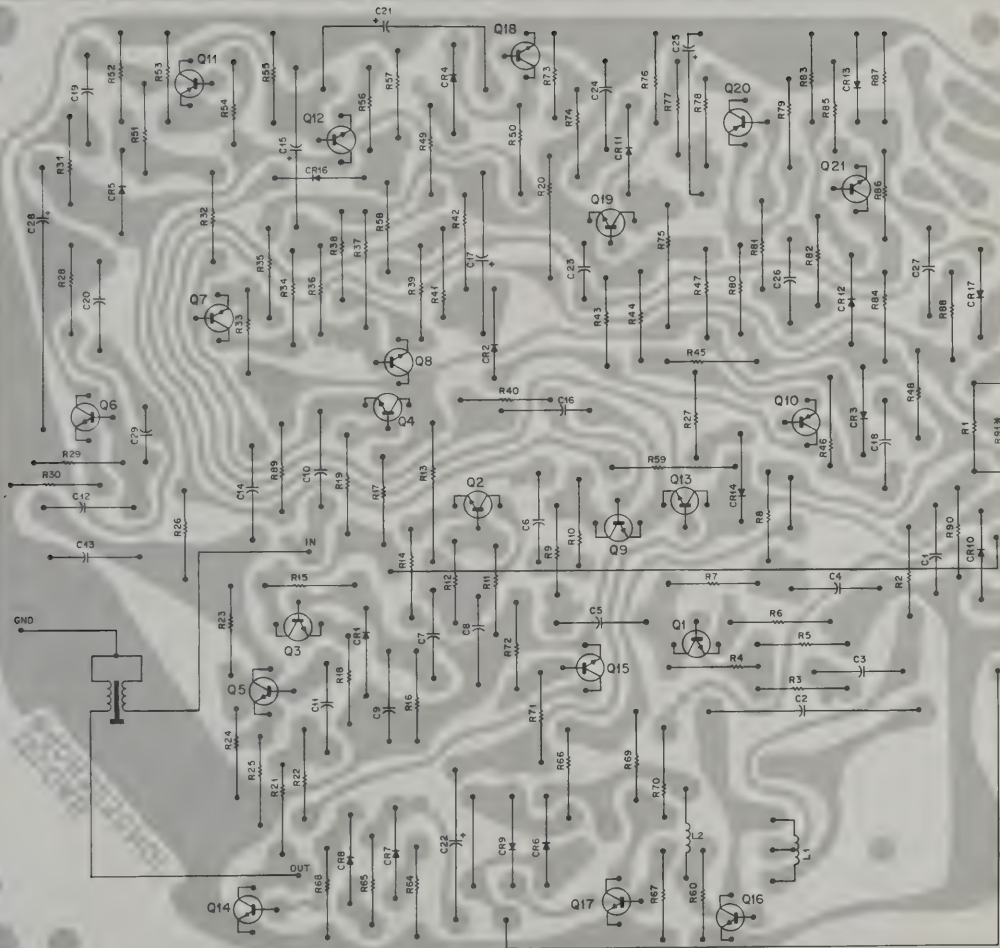
Model	Module	Reed
TLN2376A	TRN4892A	(2175 Hz) KLN6209A

TRN4892A Guard Tone Decoder
Module Circuit Board Detail
Schematic Diagram & Parts List
Motorola No. PEPS-34635-A
(Sheet 2 of 2)

10/5/82 - V & G

ohms; capacitor values are in

Off when guard and function tone are detected to enable gated AGC and function detectors. Turns on after loss of activity, off PTT and disable gated AGC. Turn on is by C25 charge 75 ms to prevent loss of to line interruptions.



SHOWN FROM COMPONENT SIDE

* R91 LOCATED ON SOLDER SIDE.

BD - DEPS-34432-0
OL - DEPS-34431-A

parts list

TRN4892A Guard Tone Decoder Module PL-7638-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-82905G26	capacitor, fixed: uF ± 10%; 50 V; unless otherwise stated
C2	8-84326A29	0047
C3	8-82905G07	005 ± 2%
C4	8-82905G11	0.22
C5, 6, 7	8-82905G02	0.22
C8	8-82905G25	0033
C9	8-82905G01	0.1
C10	8-82905G11	0.22
C11 thru 14	8-82905G04	0.68
C15	23-865136	15 ± 20%; 25 V
C16	8-82905G03	.047
C17	23-865136	15 ± 20%; 25 V
C18, 19, 20	8-82905G04	0.68
C21	23-865137	4.7 ± 20%; 25 V
C22	23-82783808	1.0 ± 20%; 35 V
C23	21-82187820	.001; 100 V
C24	8-82905G11	0.22
C25	23-82783812	4.7
C26	8-82905G07	0.1
C27	8-82905G11	0.22
C28	23-82801A25	100 ± 150-10%; 20 V
C29	21-82187820	.001; 100 V
CR1 thru 4	48-83654H01	semiconductor device, diode: (see note)
CR10	48-83654H01	silicon
CR17	48-83654H01	silicon
L1	1-80702B11	coil, assembly, inductor: 1 H; incl. ground clip
L2	24-82723H01	choke; 1.2 uH
Q1	48-869539	transistor: (see note)
Q2	48-869594	NPN; type M9594
Q3, 4	48-869570	NPN; type M9570
Q5	48-869594	NPN; type M9594
Q6	48-869570	NPN; type M9570
Q7	48-869571	PNP; type M9571
Q8	48-869570	NPN; type M9570
Q9	48-869594	NPN; type M9594
Q10, 11	48-869571	NPN; type M9571
Q12 thru 14	48-869570	NPN; type M9570
Q15	48-869646	NPN; type M9646
Q16	48-869642	NPN; type M9642
Q17 thru 19	48-869570	NPN; type M9570
Q20	48-869571	PNP; type M9571
Q21	48-869570	NPN; type M9570
R1	6-11009C86	resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R2	6-11009C89	91k
R3	6-11009C81	6.8k
R4	6-11009D06	220k
R5	6-11009C07	100k
R6	6-11009C49	1k
R7	6-11009C73	10k
R8	6-11009C81	22k
R9	6-11009C77	15k
R10	6-11009C61	3.3k
R11	6-11009D02	150k
R12	6-11009D18	680k
R13	6-124A73	10k; 1/2 W
R14	6-11009C45	660
R15	6-11009D18	680k
R16	6-11009D08	270k
R17	6-11009C73	10k
R18	6-11009C41	470
R19	6-11009C45	680
R20	6-125A37	330; 1/2 W
R21	6-11009C53	1.5k
R22	6-11009C13	33
R23	6-11009C93	68k
R24	6-11009C83	27k
R25	6-11009C01	10
R26, 27	6-11009C49	1k
R28	6-11009C83	68k
R29	6-11009C83	27k
R30	6-11009C11	27
R31	6-11009C49	1k
R32	6-11009C75	12k
R33	6-11009C33	220
R34	6-11009C89	47k
R35	6-11009C57	2.2k
R36	6-11009C99	120k
R37	6-125A37	100k; 1/2 W
R38	6-11009C81	22k
R39	6-11009C93	68k
R40	6-11009C73	10k
R41	6-11009C89	47k
R42	6-11009C95	82k
R43, 44	6-11009C57	2.2k
R45	6-11009C37	330
R46	6-11009C75	12k
R47	6-11009C61	3.3k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R48	6-11009C51	12k
R49, 50	6-11009C13	33
R51	6-11009C75	12k
R52	6-11009C61	3.3k
R53	6-11009C57	2.2k
R54	6-11009C36	270
R55	6-11009C89	47k
R56	6-11009C85	4.7k
R57	6-11009C57	2.2k
R58	6-11009C25	100
R59	6-125A49	1k; 1/2 W
R60	6-11009C89	47k
R61		NOT USED
R62		NOT USED
R63		NOT USED
R64	8-11009C75	12k
R65	6-11009C61	3.3k
R66	6-11009C85	33k
R67, 68	6-11009C89	47k
R69, 70	6-11009C57	2.2k
R71	6-11009C73	10k
R72	6-11009C89	47k
R73	6-11009C49	1k
R74	6-11009C81	3.3k
R75	6-125A48	1k; 1/2 W
R76	6-11009C49	1k
R77	6-11009C83	3.9k
R78	6-11009C49	1k
R79	6-11009C57	2.2k
R80	6-11009C25	100
R81	6-11009C57	2.2k
R82	6-11009C73	10k
R83	6-11009C57	2.2k
R84	6-11009C49	1k
R85	6-11009C09	22
R86	6-11009C93	68k
R87	6-11009C83	27k
R88	6-11009C37	330
R89	6-11009C01	10
R90	6-11009C57	2.2k
R91	6-11009C74	11k
mechanical parts		
45-83814G01	GUIDE, card	
9-83897M01	RECEPTACLE, female; 15 used	
5-84220B01	BUSHING, 2 used	
3-84258M01	SCREW, machine: 4-40 x 5/16"; 2 used	
46-84703E01	GUIDE, circuit bd.	
6-83128L01	PANEL	

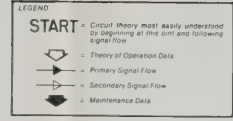
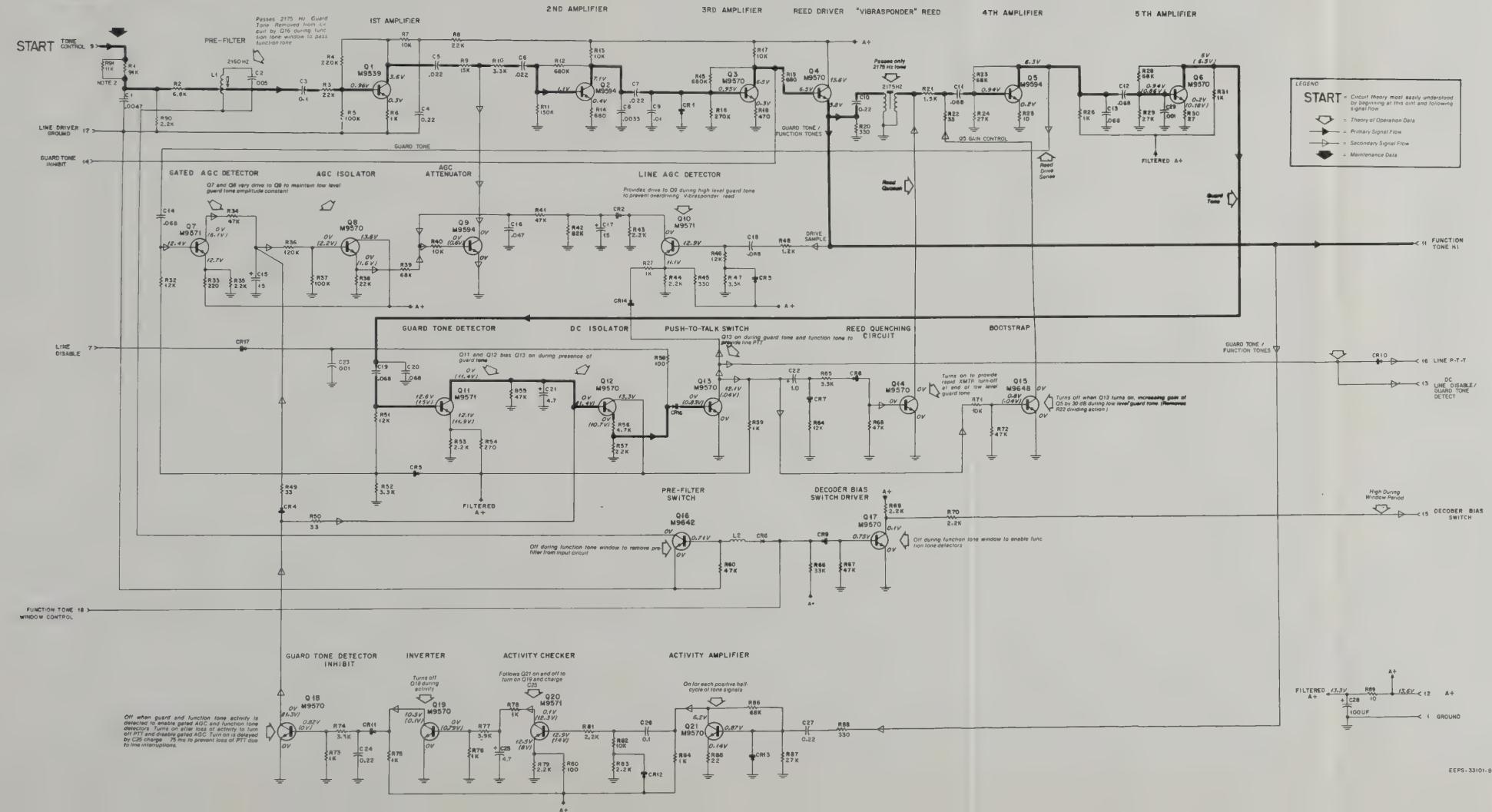
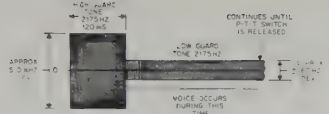
Vibrasponder Resonant Reed PL-7638-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	KLNE209A	2175 Hz

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

GUARD TONE DECODER MODULE

MODEL TLN2376A



FUNCTION

This module detects 2175 Hz guard tone and converts it into line PTT signal which is required for remote key up of the transmitter. It also amplifies received function tones and distributes them to other function tone decoders in the station (for example the 1950 Hz tone detector in the FI Control Module).

The automatic gain control circuitry in this module adjusts guard tone and function tone levels for proper operation of tone decoding circuitry independent of input levels to the remote control chassis of the station.

The activity detector stages sense the loss of low level guard tone. The fast turn off circuitry quickly turns off the line PTT signal so the station can rapidly enter the binary mode of operation or un-key the transmitter depending on the commands sent to the station.

This module also has a switchable bandpass filter to allow only the guard tone frequency to enter the module to provide falsing protection. After detection of guard tone, this filter is switched out during the time function commands are sent to the station and during this period, the tone decoders are enabled. This allows function tones of various frequencies to be amplified in the guard tone decoder prior to being sent to the respective function tone decoders. The switching of the filter is controlled by circuitry in the TRN4854A Station Control Module.

Model Complement		
Model	Module	Reed
TLN2376A	TRN4892A	(2175 Hz) KLN6209A

TRN4892A Guard Tone Decoder
Module Circuit Board Detail
Schematic Diagram & Parts List
Motorola No. PEPS-34635-A
(Sheet 2 of 2)
10/5/82 - V & G

NOTES

- Unless otherwise indicated: resistor values are in ohms, capacitor values are in microfarads
- R91 located on solder side of circuit board

parts list

TRN4854B Station Control Module

PL-8156-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed: uF		
C1	23-865136	15 \pm 20%; 20 V
C2	21-82187B20	001 \pm 10%; 100 V
C3	23-865136	15 \pm 20%; 20 V
C4	21-82187B20	.001 \pm 10%; 100 V
C5	21-865136	15 \pm 20%; 20 V
C6, 7, 8	21-82187B20	.001 \pm 10%; 100 V
diode: (see note)		
CR1 thru 4	48-83654H01	silicon
CR5	48-82466H13	silicon
CR6 thru 22	48-83654H01	silicon (CR22 optional)
lamp, incandescent:		
DS1	65-83554G01	12 volts; 0.19 amp
transistor: (see note)		
Q1	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6	48-869568	NPN; type M9568
Q7	48-869643	PNP; type M9643
Q8	48-869642	NPN; type M9642
Q9	48-869568	NPN; type M9568
Q10, 11, 12	48-869642	NPN; type M9642
resistor, fixed: \pm 5%; 1/4 W; unless otherwise stated		
R1	6-11009D02	150k
R2	6-11009C87	39k
R3	6-11009C39	390
R4	6-11009C49	1k
R5	6-11009C61	3.3k
R6	6-11009C45	680
R7	6-11009C01	10
R8	6-11009C71	8.2k
R9	6-11009C89	47k
R10	6-11009C71	8.2k
R11	6-11009C45	680
R12	6-11009C61	3.3k
R13	6-11009C45	680
R14	6-11009C01	10
R15	6-11009C89	47k
R16	6-11009C49	1k
R17	6-11009C37	330
R18	6-11009C61	3.3k
R19	6-11009C45	680
R20	6-11009C01	10
R21	6-11009C73	10k
R22, 23	6-11009C59	2.7k
R24, 25	6-11009C73	10k
R26	6-11009C57	2.2k
R27	6-11009C73	10k
R28	6-11009C61	3.3k
R29	6-11009C53	1.5k
R30	6-11009C69	6.8k
R31	6-11009C73	10k
R32	6-11009C53	1.5k
R33, 34	6-11009C57	2.2k
R35	6-11009C49	1k
R36, 37	6-11009C73	10k
R38, 39	6-11009C97	100k
R40, 41	6-11009C73	10k
R42	6-11009C97	100k
R43	6-11009C61	3.3k
switch:		
S1	40-83468E01	slide; spdt
S2, 3	40-83204B01	slide; dpdt
integrated circuit: (see note)		
U1	51-82884L63	Schmitt trigger inverter
U2	51-82884L13	D flip-flop
U3	51-82884L04	quad NOR gate
mechanical parts		
	1-80761D38	PANEL, screened; includes: S1, 2, 3
	9-84285C01	LAMPHOLDER, single contact
	61-855798	JEWEL, lamp GRN
	46-84603E01	GUIDE, circuit board
	45-83914G01	GUIDE, card; 2 used
	3-125790	SCREW, machine; 4-40 x 5/16"; 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

STATION CONTROL MODULE

MODEL TRN4854B



FUNCTION

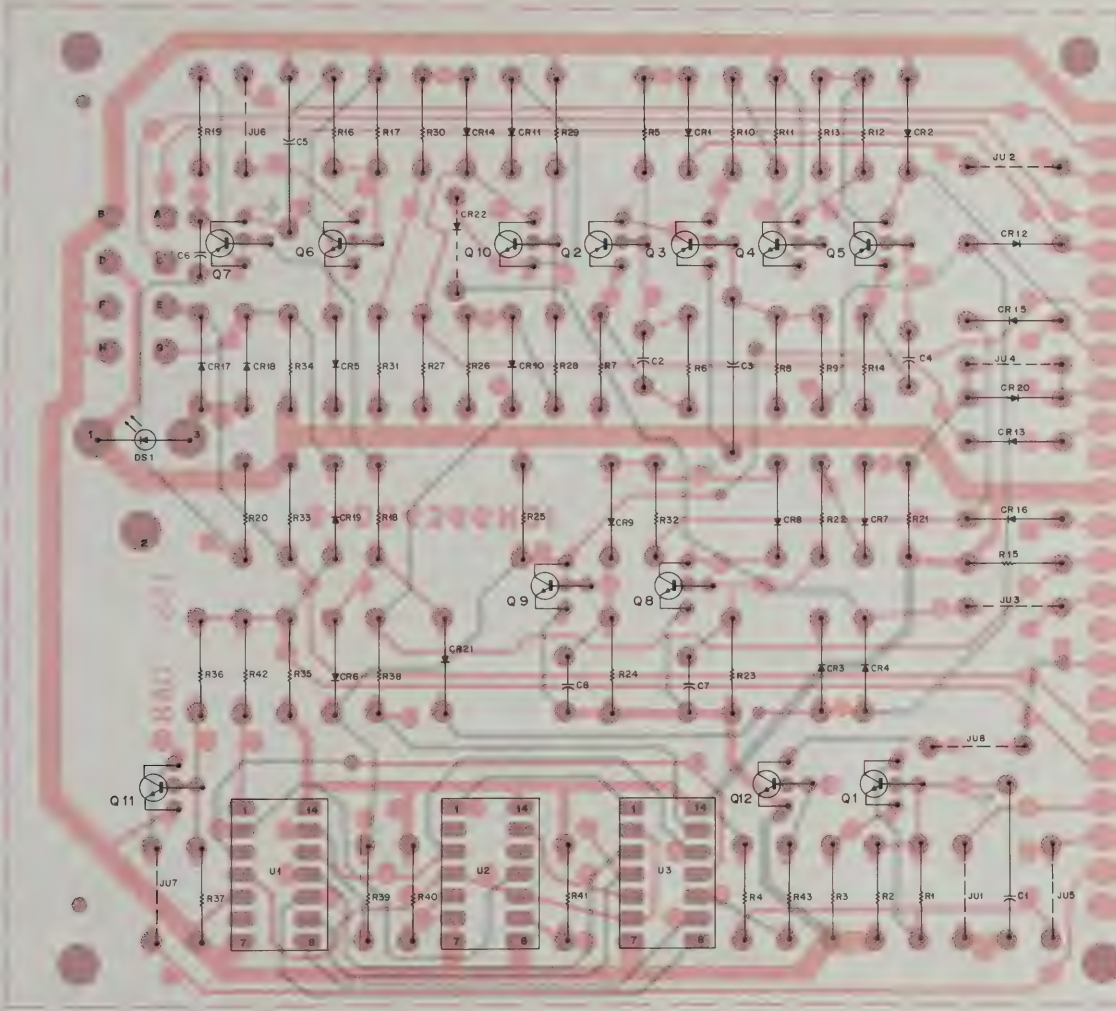
This module integrates control functions from other modules in the station to key the transmitter. Keyed A + and a A - voltages are generated in this module to provide transmitter turn on. Local transmitter keying is accomplished via a panel mounted "XMIT" switch. The LINE DISABLE and PL DISABLE switch also on the front panel, are used to disable remote keying for maintenance purposes, and the PL DISABLE switch is used for local channel monitoring in those cases where a monitor or link receiver is used.

Other circuitry in the model provides for control of the prefilter on the guard tone decoder module. This allows for function tones to pass through the guard tone decoder at the proper time in route to function tone decoder modules such as the F1 control module.

*TRN4854B Station Control Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-35213-O
(Sheet 2 of 2)
9/24/82 - V&G*

STATION CONTROL MODULE
MODEL TRN4854B

TRN4854B Station Control Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-35213-O
(Sheet 1 of 2)
9/24/82 - V&G



SHOWN FROM COMPONENT SIDE

SOLDER SIDE= 8D-DEPS-35215-O
COMPONENT SIDE 8D-DEPS-35216-O
OL-DEPS-35217-O

parts list

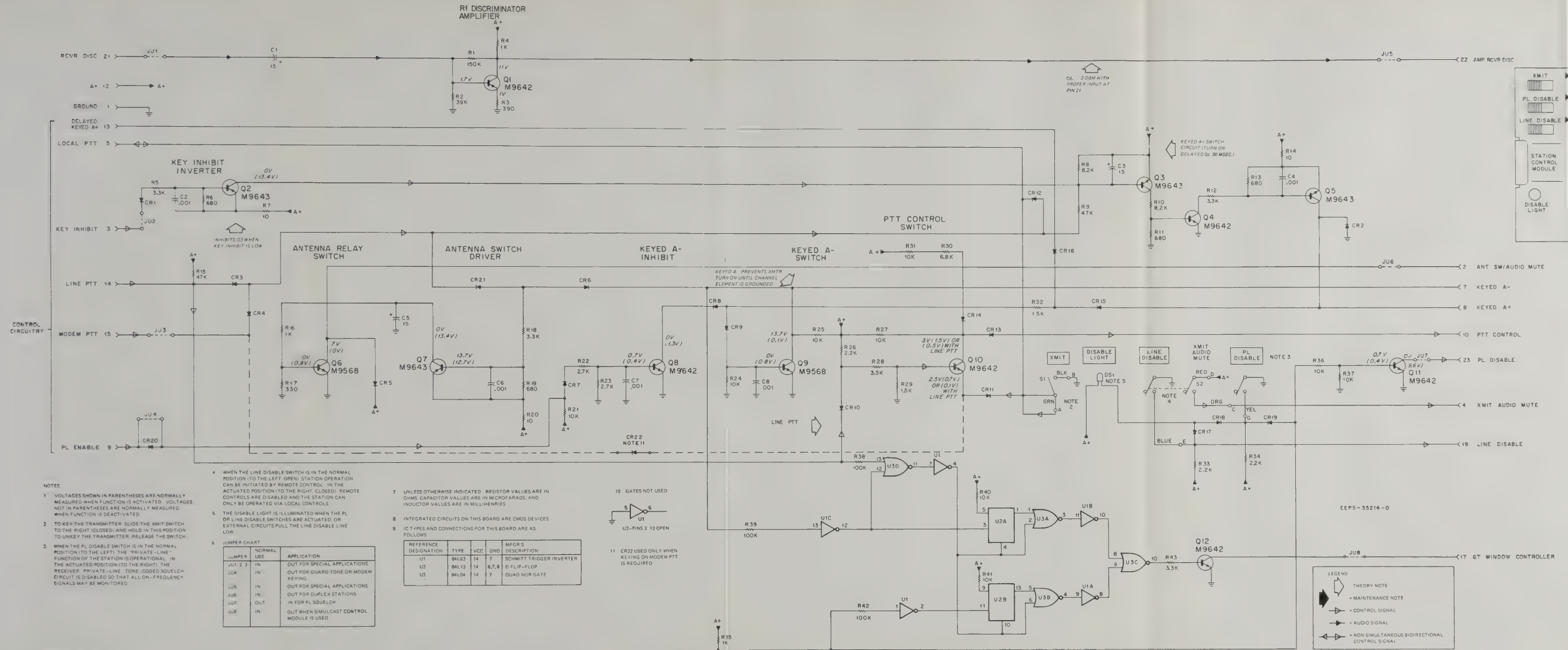
TRN4854B Station Control Module PL-8155-O

- 1 GND
- 2 ANT SW/AUDIO MUTE
- 3 KEY INHIBIT
- 4 XMIT AUDIO MUTE
- 5 LOCAL PTT
- 6
- 7 KEYED A-
- 8 KEYED A+
- 9 PL ENABLE
- 10 PTT CONTROL
- 11
- 12 A +
- 13 DELAYED KEYED A +
- 14 LINE PTT
- 15 MODEM PTT
- 16
- 17 GT WINDOW CONTROLLER
- 18
- 19 LINE DISABLE
- 20 PL DISABLE CONTROL
- 21 R1 DISC
- 22 AMP RCVR DISC
- 23 PL DISABLE
- 24

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed uF		
C1	23865136	15 ± 20%; 20 V
C2	21-82187B20	.001 ± 10%; 100 V
C3	23865136	15 ± 20%; 20 V
C4	21-82187B20	.001 ± 10%; 100 V
C5	21865136	15 ± 20%; 20 V
C6, 7, 8	21-82187B20	.001 ± 10%; 100 V
diode (see note)		
CR1 thru 4	48-8354H01	silicon
CR5	48-8246B13	silicon
CR6 thru 22	48-8354H01	silicon (CR22 optional)
lamp, incandescent:		
DS1	65-83554G01	12 volts; 0.19 amp
transistor (see note)		
Q1	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6	48-869568	NPN; type M9568
Q7	48-869643	PNP; type M9643
Q8	48-869642	NPN; type M9642
Q9	48-869568	NPN; type M9568
Q10, 11, 12	48-869642	NPN; type M9642
resistor, fixed: ± 5%; 1/4 W;		
unless otherwise stated		
R1	6-11009D02	150k
R2	6-11009C27	30k
R3	6-11009C39	90
R4	6-11009C49	1k
R5	6-11009C61	3.3k
R6	6-11009C45	680
R7	6-11009C01	10
R8	6-11009C71	8.2k
R9	6-11009C39	47k
R10	6-11009C71	8.2k
R11	6-11009C45	680
R12	6-11009C61	3.3k
R13	6-11009C45	680
R14	6-11009C01	10
R15	6-11009C39	47k
R16	6-11009C49	1k
R17	6-11009C37	330
R18	6-11009C61	3.3k
R19	6-11009C45	680
R20	6-11009C01	10
R21	6-11009C73	10k
R22, 23	6-11009C59	2.7k
R24, 25	6-11009C73	10k
R26	6-11009C57	2.2k
R27	6-11009C73	10k
R28	6-11009C61	3.3k
R29	6-11009C53	1.5k
R30	6-11009C69	6.8k
R31	6-11009C73	10k
R32	6-11009C53	1.5k
R33, 34	6-11009C57	2.2k
R35	6-11009C49	1k
R36, 37	6-11009C73	10k
R38, 39	6-11009C97	100k
R40, 41	6-11009C73	10k
R42	6-11009C97	100k
R43	6-11009C61	3.3k
switch		
S1	40-83468E01	slide, spdt
S2, 3	40-83204B01	slide, dpdt
integrated circuit (see note)		
U1	51-8288AL63	Schmitt trigger inverter
U2	51-8288AL13	D flip-flop
U3	51-8288AL04	quad NOR gate
mechanical parts		
1-80761D38	PANEL, screened, includes S1, 2, 3	
9-844285C01	LAMP/HOLDER, single contact	
1-8655786	JEWEL, lamp GRN	
46-84603E01	GUIDE, circuit board	
45-83914G01	GUIDE, card; 2 used	
3-125780	SCREW, machine, 4-40 x 5/16", 2 used	

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers

STATION CONTROL MODULE
MODEL TRN4854B



FUNCTION

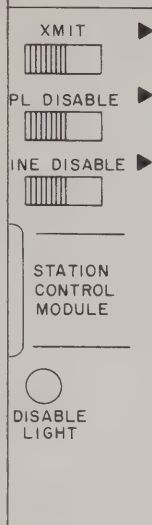
This module integrates control functions from other modules in the station to key the transmitter. Keyed A+ and A- voltages are generated in this module to provide transmitter turn on. Local transmitter keying is accomplished via a panel mounted "XMIT" switch. The LINE DISABLE and PL DISABLE switch also on the front panel, are used to disable remote keying for maintenance purposes, and the PL DISABLE switch is used for local channel monitoring in those cases where a monitor or link receiver is used.

Other circuitry in the model provides for control of the prefilter on the guard tone decoder module. This allows for function tones to pass through the guard tone decoder at the proper time in route to function tone decoder modules such as the F1 control module.

TRN4854B Station Control Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-35213-0
(Sheet 2 of 2)
9/24/82 - V & G

STATION CONTROL MODULE

MODEL TRN4854A



MUTE

MUTE

NTROLLER

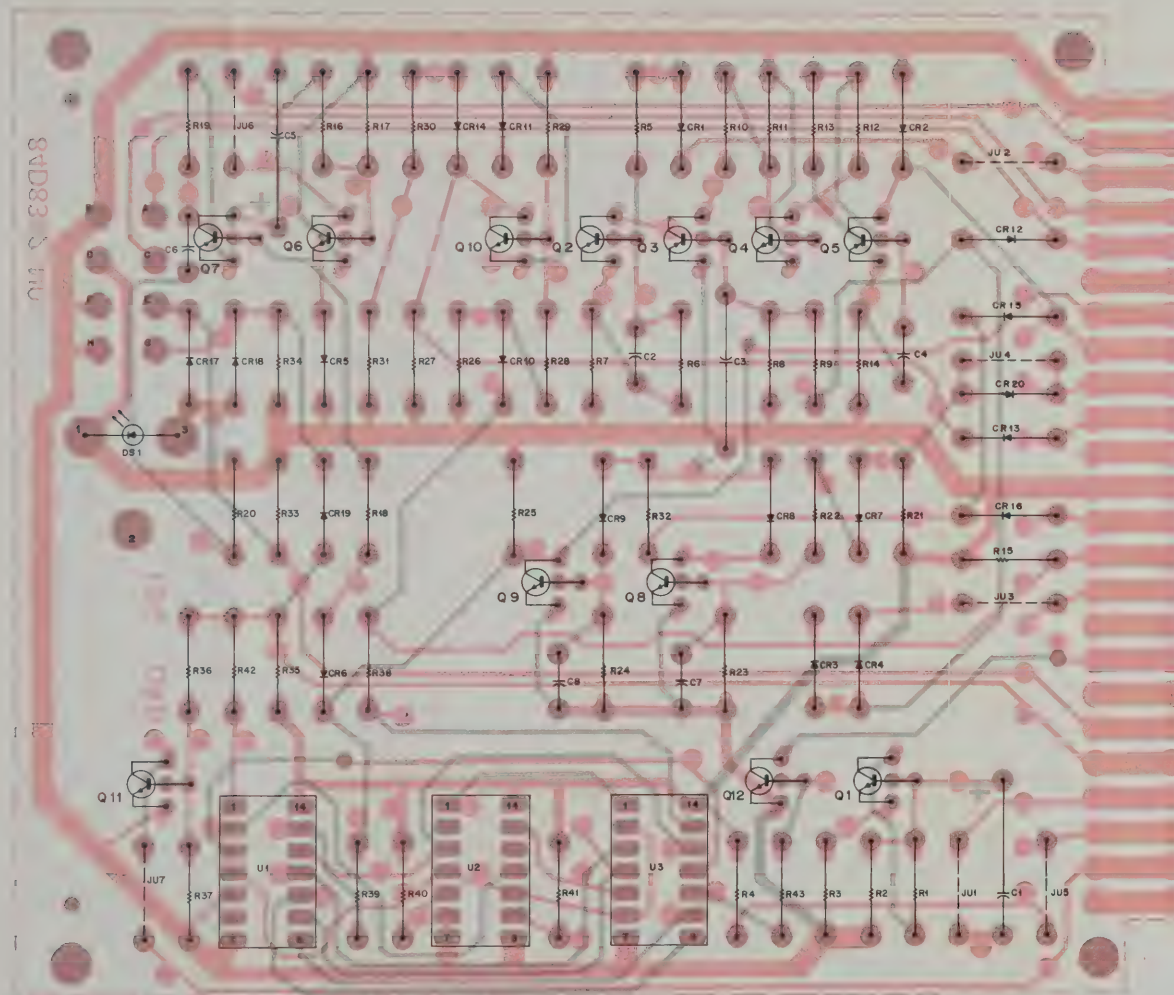
FUNCTION

This module integrates control functions from other modules in the station to key the transmitter. Keyed A+ and A- voltages are generated in this module to provide transmitter turn on. Local transmitter keying is accomplished via a panel mounted "XMIT" switch. The LINE DISABLE and PL DISABLE switches also on the front panel, are used to disable remote keying for maintenance purposes, and the PL DISABLE switch is used for local channel monitoring in those cases where a monitor or link receiver is used.

Other circuitry in the module provides for control of the prefilter on the guard tone decoder module. This allows for function tones to pass through the guard tone decoder at the proper time in route to function tone decoder modules such as the F1 control module.

*TRN4854A Station Control Module
Circuit Board Detail, Schematic Diagram
& Parts List
Motorola No. PEPS-34636-O
(Sheet 2 of 2)
5/12/82 - V & G*

STATION CONTROL MODULE



SHOWN FROM COMPONENT SIDE

SOLDER SIDE - 80-DEPS-34436-0
COMPONENT SIDE - 80-DEPS-34435-0
OL-DEPS-34434-0

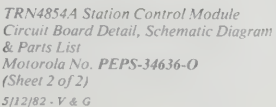
parts list

TRN4854A Station Control Module PL-7645-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	23-865136	capacitor, fixed uF
C2	21-82187B20	15 ± 20%, 20 V
C3	23-865136	001 ± 10%, 100 V
C4	21-82187B20	15 ± 20%, 20 V
C5	21-865136	.001 ± 10%, 100 V
C6, 7, 8	21-82187B20	15 ± 20%, 20 V
		.001 ± 10%, 100 V
CR1 thru 4	48-83654H01	diode (see note)
CR5	48-82466H13	silicon
CR6 thru 20	48-83654H01	silicon
DS1	65-83554G01	lamp, incandescent 12 volts; 0.19 amp
Q1	48-869642	transistor (see note)
Q2, 3	48-869643	NPN, type M9642
Q4	48-869642	NPN, type M9642
Q5	48-869643	PNP, type M9643
Q6	48-869568	NPN, type M9568
Q7	48-869643	PNP, type M9643
Q8	48-869642	NPN, type M9642
Q9	48-869568	NPN, type M9568
Q10, 11, 12	48-869642	NPN, type M9642
R1	6-11009D02	resistor, fixed: ± 5%, 1/4 W;
R2	6-11009C27	unless otherwise stated
R3	6-11009C30	150k
R4	6-11009C49	39k
R5	6-11009C61	330
R6	6-11009C45	1k
R7	6-11009C01	3.3k
R8	6-11009C71	680
R9	6-11009C80	10
R10	6-11009C71	8.2k
R11	6-11009C45	47k
R12	6-11009C61	8.2k
R13	6-11009C45	680
R14	6-11009C01	3.3k
R15	6-11009C89	10
R16	6-11009C49	47k
R17	6-11009C37	1k
R18	6-11009C61	330
R19	6-11009C45	3.3k
R20	6-11009C01	680
R21	6-11009C73	10
R22, 23	6-11009C59	10k
R24, 25	6-11009C73	2.7k
R26	6-11009C37	10k
R27	6-11009C73	2.2k
R28	6-11009C61	10k
R29	6-11009C53	3.3k
R30	6-11009C69	1.5k
R31	6-11009C73	6.8k
R32	6-11009C53	10k
R33, 34	6-11009C57	1.5k
R35	6-11009C49	2.2k
R36, 37	6-11009C73	1k
R38, 39	6-11009C97	10k
R40, 41	6-11009C73	100k
R42	6-11009C97	10k
R43	6-11009C61	3.3k
S1	40-83468E01	switch;
S2, 3	40-83204B01	slide, spdt
U1	51-82884L63	slide, dpdt
U2	51-82884L13	integrated circuit (see note)
U3	51-82884L04	Schmitt trigger inverter
		D flip-flop
		quad NOR gate
		mechanical parts
	1-80761D38	PANEL, screened, includes S1, 2, 3
	9-84285C01	LAMPHOLDER, single contact
	61-855788	JEWEL, lamp GRN
	46-84603E01	GUIDE, circuit board
	45-83914G01	GUIDE, card, 2 used
	5-125790	SCREW, machine, 4-40 x 5/16", 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

MODEL TRN4854A



STATION CONTROL MODULE



MOTOROLA INC.

Communications
Sector

ALARM LOGIC MODULE

MODEL TRN4857A

1. GENERAL

The alarm logic module is used in a Motorola radio paging station. It provides an alarm output for any of three alarm conditions: audio alarm, rf alarm, or system alarm. The alarm output is provided by the contacts of relay K1, located on the circuit board. The relay contacts are rated at 500 mA maximum, 100 V dc maximum, and 15 watts maximum.

2. INSTALLATION

2.1 The alarm logic module is supplied with two card guides that allow the module to be installed in either a unified or non-unified remote control chassis in the station.

2.2 On stations using a unified remote control chassis, the alarm logic module is installed in position 7. The relay contact output is available at TB3-2 and TB3-3 on the interconnect board. On stations using a non-unified remote control chassis, the alarm logic module is installed in position 6. The relay contact output is available at TB2-3 and TB2-5 on the interconnect board.

3. POWER THRESHOLD ADJUSTMENTS

Step 1. Remove module from remote control chassis and place on extender card.

Step 2. Preset the following controls as viewed from the module front panel. (Refer to circuit board detail for location of controls.)

- RF Forward (R18) fully counterclockwise
- Audio (R9) fully counterclockwise
- RF Reverse (R23) fully clockwise
- Disable System Timer by setting switch S4 to "ON"

Step 3. Install module and card extender into remote control chassis.

Step 4. Connect a jumper from J100-13 on the remote control interconnect board to the forward power terminal (white) on the wattmeter. Make sure the red (reverse power) wire is not connected to J100-13.

Step 5. Set wattmeter to Fwd — High. Keying into a 50 ohm load, set output power to 18% of rated output power of the station.

Step 6. Rotate the RF Reverse control (R23) on the alarm logic module, until the alarm LED just lights.

Step 7. Disconnect the jumper stated in Step 4, and connect the red (reverse power) wire from the wattmeter to J100-13.

Step 8. Tune transmitter to 50% of rated output power.

Step 9. Rotate the RF Forward control (R18) on the alarm logic module, until the alarm LED just lights.

Step 10. Tune the station to rated power output.

4. AUDIO LEVEL ADJUSTMENT

4.1 The alarm logic module modulation check requires that the initial burst of high level guard tone be used to verify proper audio level. Any control configuration which does not begin the keying sequence with high level guard tone, requires the modulation check to be disabled on the alarm logic module. To disable the modulation check, turn R9 on the alarm logic module fully counterclockwise.

4.2 If the modulation check is to be used to verify proper audio level, the audio trip point must be set

technical writing services

by R9, to a point 6 dB below the normal level of high level guard tone. Follow the procedure outlined in Steps 1 and 2.

NOTE

The station must be in normal operating condition before the audio trip point on the alarm logic module is set (phone line and exciter level adjustments must be set at normal levels). Any change in exciter level adjustment requires readjustment of the audio trip point on the alarm logic module.

Step 1. Apply a 2175 Hz sine wave at a level 6 dB below normal high level guard tone to the phone line.

Step 2. Monitor the voltage at pin 7 of U1 on the alarm logic module and adjust audio control R9 until this voltage just drops to near ground.

5. SYSTEM TIMER PROGRAMMING

5.1 Dip Switch S1 (actually S1-S8) is used to program the system timer. Positions 1, 2 and 3 are not used (always in "ON" position). Position 4 is used to disable the timer. If S4 is "on" the timer is disabled. If S4 is "off" the timer causes a system alarm at a programmable time after loss of push-to-talk. Positions 5, 6, 7 and 8 are used to program the timer. The following table gives approximate times for each combination of switch positions.

Table 1. System Timer Programmable Times

S8	S7	S6	S5	Time
0	0	0	0	10 seconds
0	0	0	1	21 seconds
0	0	1	0	42 seconds
0	0	1	1	1.5 min.
0	1	0	0	2.8 min.
0	1	0	1	5.7 min.
0	1	1	0	11.3 min.
0	1	1	1	23 min.
1	0	0	0	45 min.
1	0	0	1	1.5 hr.
1	0	1	0	3 hr.
1	0	1	1	6 hr.
1	1	0	0	12 hr.
1	1	0	1	1 day
1	1	1	0	2 days
1	1	1	1	4 days

0 = ON
1 = OFF

5.2 An example is shown in Figure 1, on how dip switch S1 is set to program the system timer to produce an alarm 45 minutes after loss of push-to-talk. Refer to Figure 1.

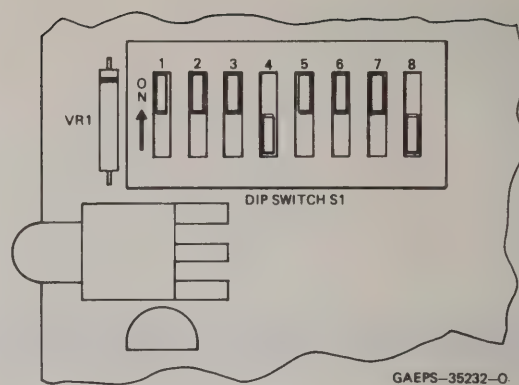


Figure 1. Timer Set to Alarm 45 Minutes After Loss of Push-To-Talk

6. ALARM LOGIC MODULE JUMPERING INFORMATION

The relay contacts may be jumpered to either open or close on an alarm or on verification. The alarm logic module is shipped with jumpers set to close the contacts on an alarm. See jumper table on the schematic diagram for other possible jumper configurations.

7. THEORY OF OPERATION

7.1 AUDIO ALARM

Integrated circuit U1C amplifies the unnotched microphone audio and applies it to level detector CR1 and C5. It is then applied to U1B-5, which compares the audio level with a reference level set by R9 at U1B-6. The reference level is set for an audio level of 6 dB below normal high level guard tone. During high level guard tone, delayed keyed A+ is inverted by U2A-2, and applied to latch U3B and U3C. If high level guard tone is of sufficient level, a logic low ("0") is latched at U3C-10. This indicates there is no audio alarm. If high level guard tone is degraded by more than 6 dB, a logic high "1" appears at U3C-10, indicating an audio alarm at pin 17.

7.2 RF ALARM

7.2.1 Operational amplifier U1D samples the forward power (pin 22) as detected by the wattmeter. the forward power is compared to a reference level set by R18. The reference level is set to one-half of the rated power, a logic high ("1") appears at U3A-3, indicating

an rf failure. In a similar manner U1A samples the reflected power (pin 8) and compares it to a reference level set by R23 (18% of station power). If the reflected power exceeds the pre-set limit, a logic high ("1") appears at U3A-3, indicating an rf alarm.

7.2.2 Transistor Q9 is a constant current source for Zener diode VR1. VR1 is a precision temperature compensated voltage reference, that is used by the audio and rf comparators.

7.3 SYSTEM ALARM

Integrated circuit U6 is a programmable timer. C10 and R35 form an RC time constant for an oscillator that is divided by 24 flip-flop stages; the last 16 stages are selectable by a four-bit binary code programmed by switches S5, 6, 7, and 8. Switch S4 can be closed to disable the timer completely. The timer is reset by Q7 via CR2, CR3, or CR4, whenever there is a push-to-talk function. C13 causes the timer to reset on initial power up. If a push-to-talk function does not occur within a predetermined time limit, a system alarm occurs via Q3.

7.4 VERIFICATION LOGIC CIRCUITRY

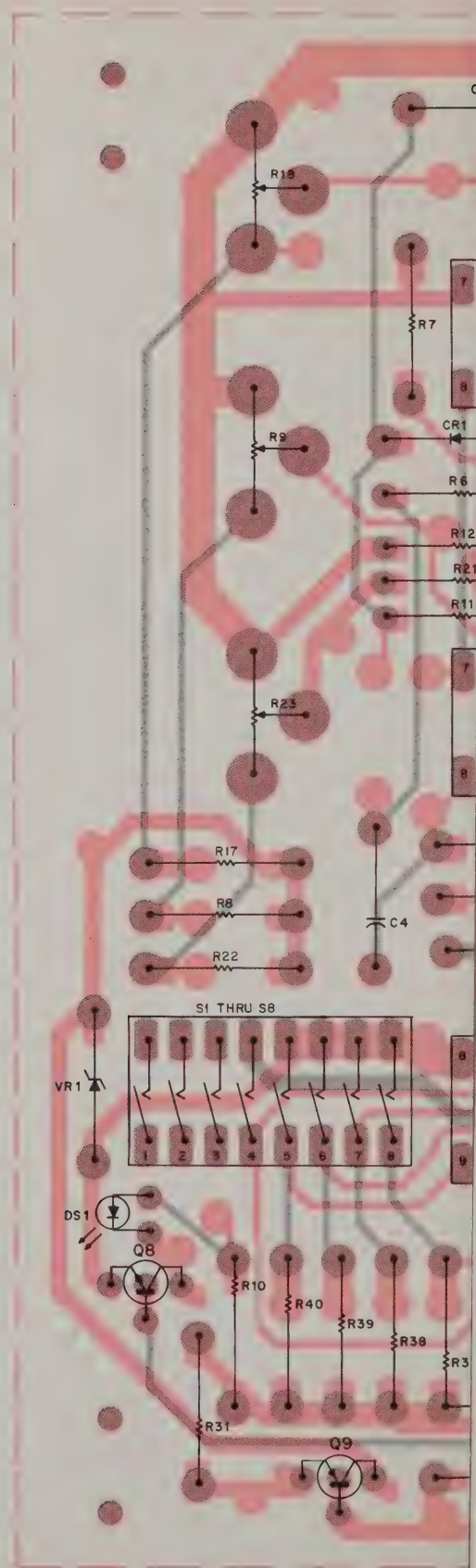
The verification logic circuit consists of U4 and U2B, C, and F. When a channel element ground appears at pin 3 and an audio signal appears at pin 11 with

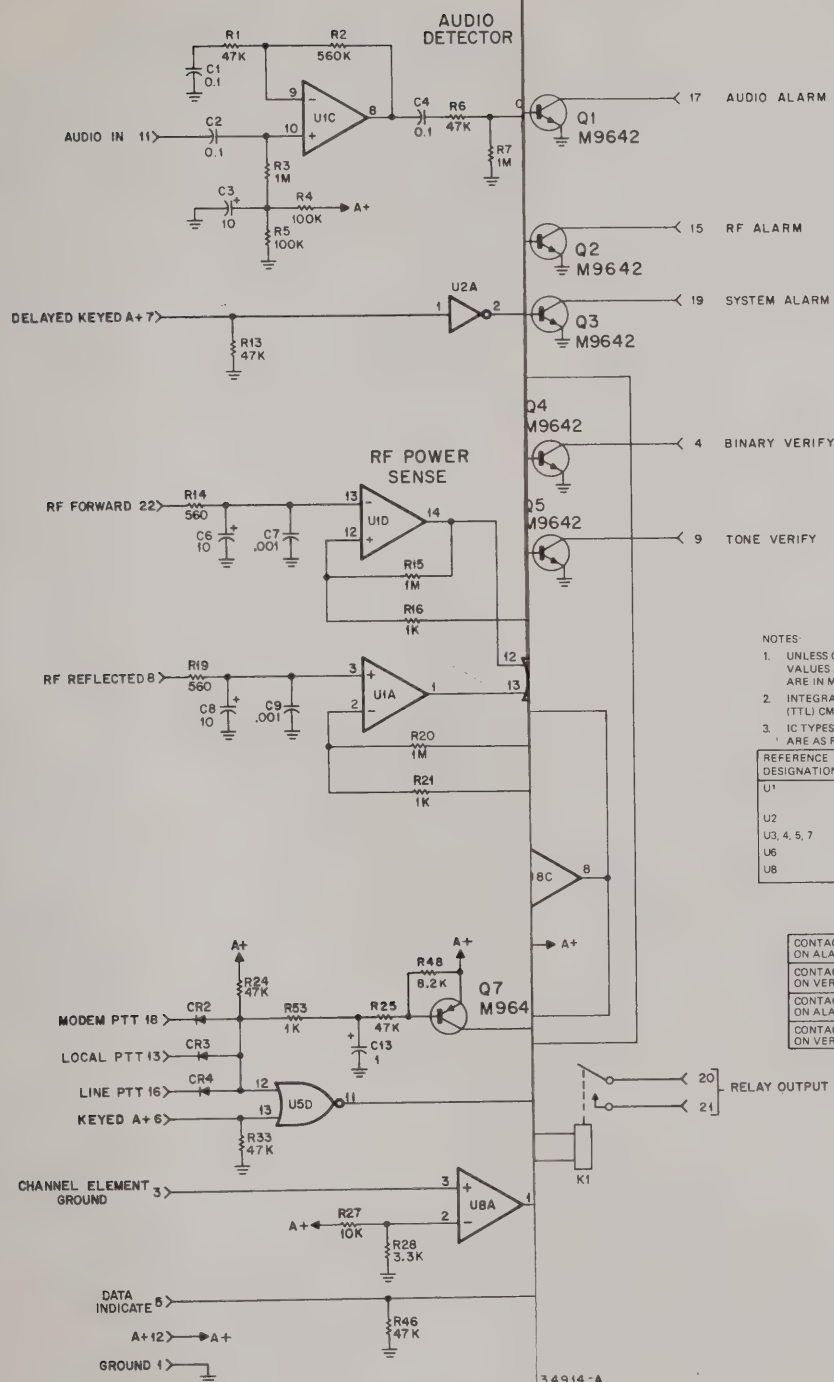
rated rf power at pin 22, a logic high appears at the output of U4B-4. If JU2 is in, relay K1 is activated to provide verification. Transistors Q4 and Q5 supply open collector outputs to indicate the station is keyed up in the binary mode (Q4) or the tone mode (Q5).

7.5 ALARM LOGIC CIRCUITRY

The alarm logic circuitry consists of U5, U2D, E, and U8C. U5 detects any of the alarm conditions (audio, rf, or system). Upon detection of an alarm, U5A-3 goes low, causing U2D-8 to go high. The output of U2D is applied to R41, C12, and U8C, to form a time delay that blocks transient alarm conditions that occur during the key-up sequence. The output of U8C is at a logic high ("1") when an alarm condition exists. The output of U8C-8 is routed to JU1, which can be connected to operate K1 relay. The alarm signal also lights the front panel alarm LED (DS1) via Q8. During an alarm condition U7 decodes the type of alarm. Transistors Q1, Q2, and Q3 provide open collector outputs to indicate an audio alarm (Q1), and rf alarm (Q2), or a system alarm (Q3).

TRN4857A Alarm Logic Module
 Schematic Diagram, Circuit Board Detail
 & Parts List
 Motorola No. PEPS-34991-O
 (Sheet 1 of 2)
 8/31/82 - V&G





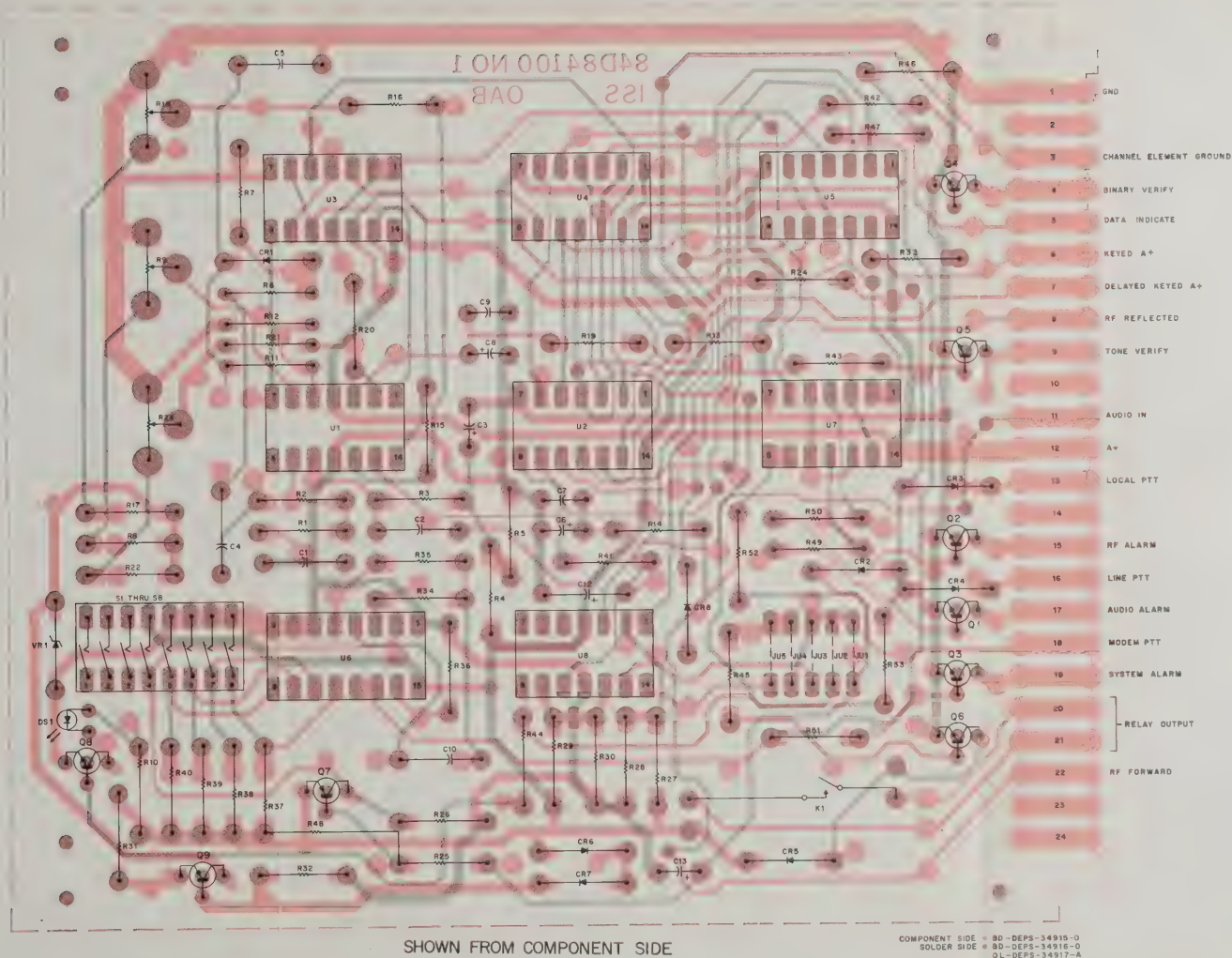
- NOTES
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
 2. INTEGRATED CIRCUITS ON THIS BOARD ARE (TTL) CMOS DEVICES.
 3. IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS

REFERENCE DESIGNATION	TYPE	Vcc	GND	MFGR'S DESCRIPTION
U1	29M08	4	11	QUAD OP AMP
U2	84L03	14	7	HEX INVERTER
U3, 4, 5, 7	84L04	14	7	QUAD 2-INPUT NOR GATE
U6	84L62	16	8	PROGRAMMABLE TIMER
U8	29M08	4	11	QUAD OP-AMP

JUMPERS USED	
CONTACT CLOSURE ON ALARM	JU1, JU4
CONTACT CLOSURE ON VERIFICATION	JU2, JU4
CONTACT OPEN ON ALARM	JU1, JU3, JU5
CONTACT OPEN ON VERIFICATION	JU2, JU3, JU5

TRN4857A Alarm Logic Module
Schematic Diagram, Circuit Board Detail,
& Parts List
Motorola No. PEPS-34991-O
(Sheet 2 of 2)
8/31/82 - V&G

TRN4857A Alarm Logic Module
Schematic Diagram, Circuit Board Detail
& Parts List
Motorola No. PEPS-34991-0
(Sheet 1 of 2)
8/31/82 - V&G



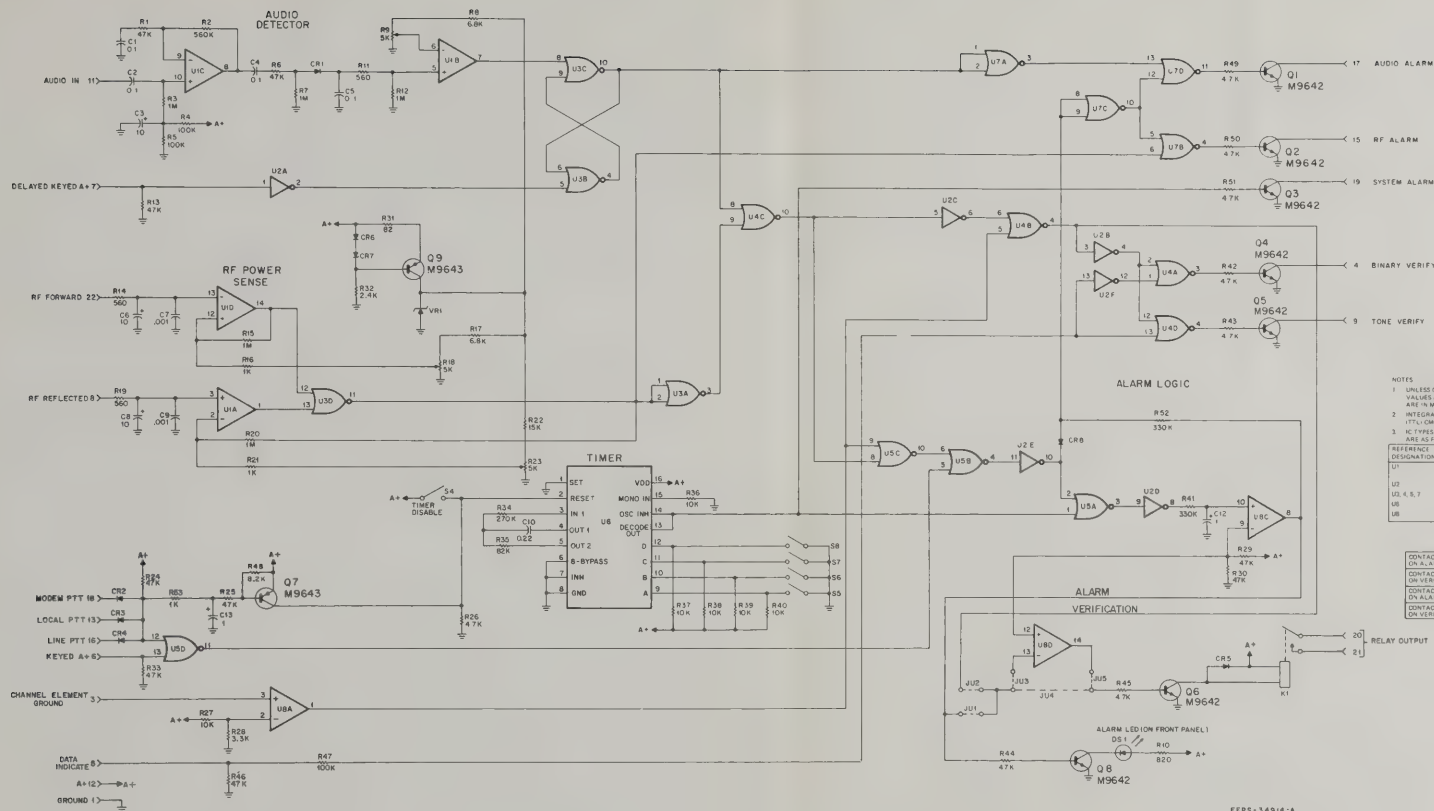
parts list

TRN4857A Alarm Logic Module

PL 8099 0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2	8-84637L14	capacitor, fixed: $\pm 10\%$, 100 V, unless otherwise stated
C3	23-11013C54	0.1 μ F
C4, 5	8-84637L14	10 μ F $\pm 20\%$, 15 V
C6	23-11013C54	0.1 μ F
C7	21-11015B13	10 μ F $\pm 20\%$, 15 V
C8	23-11013C54	0.01 μ F
C9	21-11015B13	0.01 μ F
C10	8-84637L44	0.22 μ F $\pm 5\%$
C11	23-84538G14	NOT USED
C12	1 μ F, 35 V	1 μ F, 35 V
C13	23-11013D01	1 μ F, 20 V
CR1, 2, 3, 4	48-83654H01	diode: (see note)
CR5	48-82466H13	silicon
CR6, 7, 8	48-83654H01	silicon
D51	48-88245C28	light emitting diode
K1	80-82617M01	relay
Q1 thru 6	48-869642	transistor: (see note)
Q7	48-869643	NPN, type M9642
Q8	48-869642	PNP, type M9643
Q9	48-869643	NPN, type M9642
		PNP, type M9643
R1	6-11009C89	resistor, fixed: $\pm 5\%$, 1/4 W, unless otherwise stated
R2	6-11009D16	47k
R3	6-11009D22	560k
R4, 5	6-11009C97	1 meg
R6	6-11009C89	100k
R7	6-11009D22	47k
R8	6-11009D22	1 meg
R9	6-11009C89	5.8k
R10	16-83083G07	variable, 5k
R11	6-11009C47	82k
R12	6-11009C43	560
R13	6-11009D22	1 meg
R14	6-11009C89	47k
R15	6-11009C43	560
R16	6-11009D22	1 meg
R17	6-11009C49	1k
R18	6-11009C89	6.8k
R19	16-83083G07	variable, 5k
R20	6-11009C43	560
R21	6-11009D22	1 meg
R22	6-11009C49	1k
R23	6-11009C77	15k
R24, 25	16-83083G07	variable, 5k
R26	6-11009C89	47k
R27	6-11009C25	4.7k
R28	6-11009C73	10k
R29	6-11009C61	3.3k
R30	6-11009C89	47k
R31	6-11009C23	82
R32	6-11009C58	2.4k
R33	6-11009C89	47k
R34	6-11009C08	270k
R35	6-11009C96	82k
R36 thru 40	6-11009C75	10k
R41	6-11009D10	330k
R42 thru 45	6-11009C86	4.7k
R46	6-11009C89	47k
R47	6-11009C97	100k
R48	6-11009C71	8.2k
R49, 50, 51	6-11009C86	4.7k
R52	6-11009D10	330k
R53	6-11009C49	1k
S1	40-83022M03	switch: 8-position (spst)
U1	51-83629M08	integrated circuit: (see note)
U2	51-82884L63	quad op-amplifier
U3, 4, 5	51-82884L04	hex inverter
U6	51-82884L82	quad 2-input NOR gate
U7	51-82884L04	programmable timer
U8	51-83629M08	quad 2-input NOR gate
VR1	48-82372L04	quadrant potentiometer
		voltage regulator
		Zener type: 5.25 V
		mechanical parts
	3-125790	SCREW, machine: 4-40 x 5/16"; 2 used
	45-83914G01	GUIDE, card: 2 used
	48-84703D01	GUIDE, circuit board
	64-83163L19	PANEL, screened
	9-83697M01	RECEPTACLE, board mounting, 24 used
	43-865080	BUSHING

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers



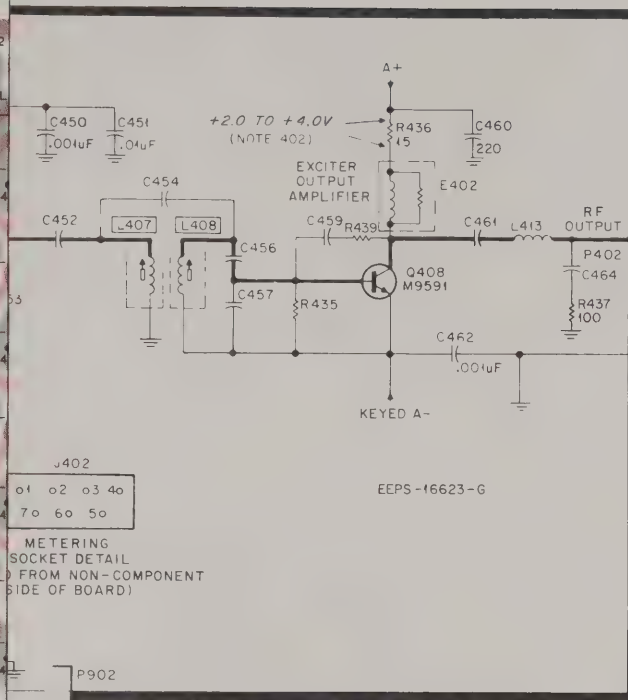
EEPS-34914-A

TRN4857A Alarm Logic Module
Schematic Diagram, Circuit Board Detail,
& Parts List
Motorola No. PEPS-34991-O
(Sheet 2 of 2)
8/31/82 - V&G

COMPONENT VALUE TABLE

COMPONENT AFFECTED	FREQUENCY RANGE (MHz)		
	30-36	36-42	42-50
C430	180	130	91
C432	390	250	175
C433	300	190	160
C438	56	39	24
C440	75	47	36
C441	220	180	60
C444	190	100	80
C445	80	56	47
C448	80	47	27
C449	150	150	130
C452	56	34	30
C453	220	220	120
C454	3.9	2.7	2.2
C456	49	34	30
C457	91	62	47
C459	24	24	82
C461	100	100	80
C463	.001	NOT USED	NOT USED
C464	15	30	NOT USED
E401	SEE FOOT NOTE		
E402			
L407			
L408			
L413	SEE FOOT NOTE		
R425	1.2k	1.2k	3.9k
R428	39k	47k	39K
R431	33k	33k	22k
R433	56k	47k	47k
R437	100	100	NOT USED
R439	NOT USED IN THESE TWO RANGES		560

PARTS NOT IDENTIFIED BY VALUE, BUT EACH FREQUENCY RANGE HAS A DIFFERENT CHARACTERISTIC.



Calculation:

C
3

Frequency

ss R436.

storized voltmeters (11 megohm) not recommended.

d, voltages measured in respect to chassis ground.

d, capacitor values are in picofarads.

te-Line and PURC paging radios.

e control stations.

actory selected so that Private-Line deviation falls 00 Hz limits. See parts list for values.

P902-5 is not connected to the transmitter interconnect

ode inputs are applied via P401-6 or P902-5.

d only in flat audio stations.

at audio board is used.

Signal Name With Flat Audio Option Signal Name

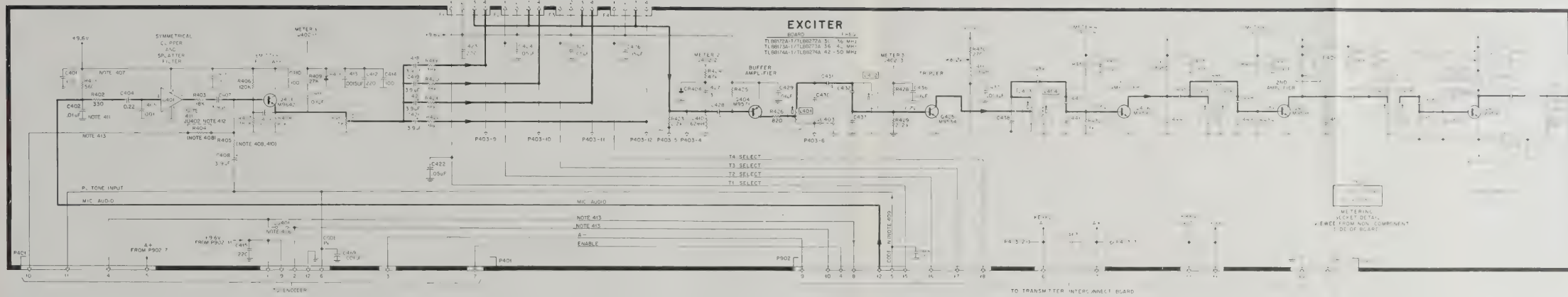
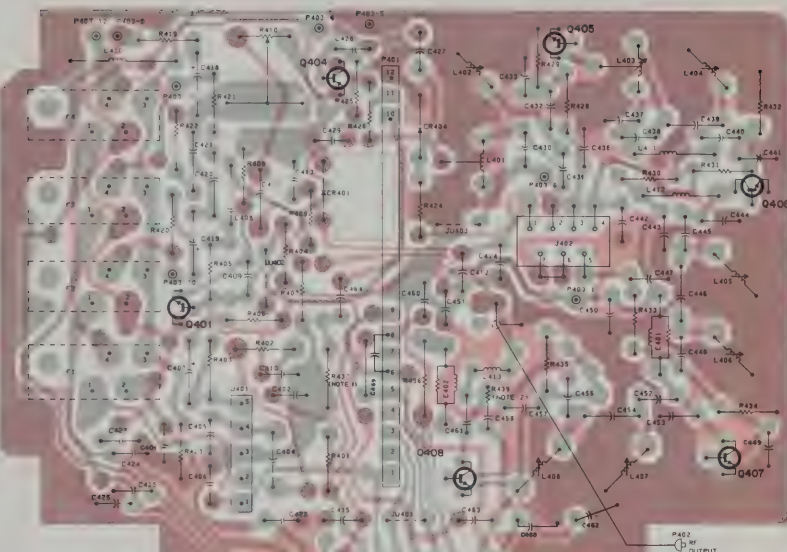
IDC Limited Flat Audio

Keyed A + Flat Audio

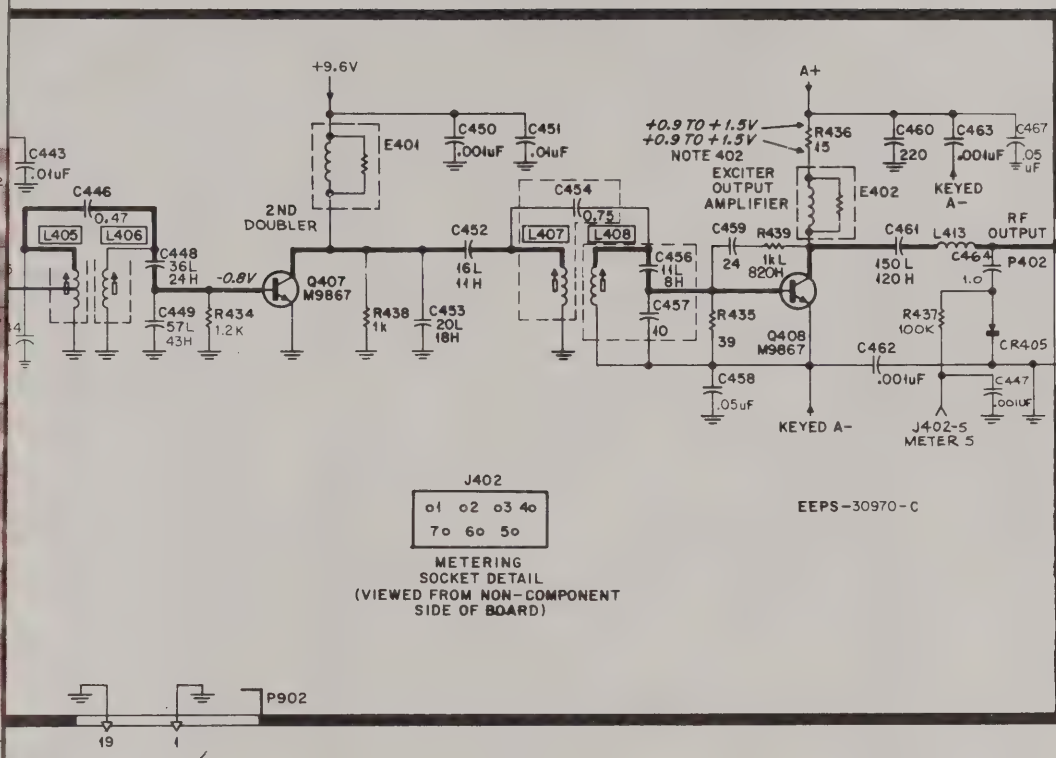
A + Flat Audio Control

PARTS LIST SHOWN
ON BACK OF THIS DIAGRAM
TLB8170A & TLB8270A Series Exciter
Schematic Diagram & Circuit Board Detail
Motorola No. PEPS-16956-G
10/5/82 - V & G

SHOWN FROM SOLDER SIDE



COMPONENT VALUE TABLE				
COMPONENT AFFECTED	FREQUENCY RANGE (MHz)			
	30-36	36-42	42-50	
C430		100	91	
C432	250	250	175	
C433	300	300	180	
C438	56	39	34	
C440	47	47	27	
C441	220	180	6.0	
C444	100	100	80	
C446	80	56	47	
C448	80	47	27	
C449	150	150	130	
C452	50	34	30	
C453	220	220	100	
C454	33	33	2.2	
C455	40	34	25	
C457	91	62	47	
C459	24	24	82	
C461	100	100	80	
C463	001	NOT USED	NOT USED	
C464	15	30	NOT USED	
C465	15	30	NOT USED	
C466	15	30	NOT USED	
C467	15	30	NOT USED	
C468	15	30	NOT USED	
C469	15	30	NOT USED	
C470	15	30	NOT USED	
C471	15	30	NOT USED	
C472	15	30	NOT USED	
C473	15	30	NOT USED	
C474	15	30	NOT USED	
C475	15	30	NOT USED	
C476	15	30	NOT USED	
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C775	15	30	NOT USED	
C776	15	30	NOT USED	
C777	15	30	NOT USED	



PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM
TLD5321B and TLD5322B Exciters
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-30974-B

5/12/82 - V & G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

LEGEND

L = 36 - 36 MHz
M = 36 - 42 MHz
TLB8172A/TLB8272A Exciter (30-36 MHz) H = 42 - 50 MHz
TLB8173A/TLB8273A Exciter (36-42 MHz)
TLB8174A/TLB8274A Exciter (42-50 MHz)
PL-5088-B

This parts list covers several models of the low band Exciter Board. Where differences exist a letter suffix L, M, or H is added to the reference symbol or model number given in the Description column to show the applicable unit.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C401	21-831125	100 $\pm 10\%$; 300 V
C402	21-82428B59	.01 μF +80-20%; 200 V
C403		NOT USED
C404	8-82905C11	.22 μF $\pm 10\%$; 50 V
C405	21-83596E13	.001 μF $\pm 10\%$; 100 V
C406	21-82428B59	.01 μF +80-20%; 100 V
C407, 408	23-84762H08	3.9 μF $\pm 20\%$; 15 V
C409, 410	21-831125	100 $\pm 10\%$; 300 V
C411	21-82372C04	0.1 μF +80-20%; 25 V
C412	21-83596E10	220 $\pm 20\%$
C413	21-82187B31	.0015 μF $\pm 10\%$; 100 V
C414	21-831125	100 $\pm 10\%$; 300 V
C415	21-83596E10	220 $\pm 20\%$
C416, 417		NOT USED
C418 thru 421	23-84762H08	3.9 μF $\pm 20\%$; 15 V
C422	21-82372C04	.05 μF +80-20%; 25 V
C423	21-83596E10	220 $\pm 20\%$
C424, 425, 426	21-82372C04	.05 μF +80-20%; 25 V
C427	21-83406D51	3 $\pm 20\%$ pF
C428	21-82187B31	.001 μF +80-20%; 100 V
C429	21-82428B59	.01 μF +80-20%; 200 V
C430L	21-84494B4	180 $\pm 3\%$
C430M	21-84494B26	130
C430H	21-84494B52	91
C431	21-83406D54	4 $\pm 20\%$
C432L	21-84494B18	390
C432M	21-855943	250
C432H	21-84494B09	175
C433L	21-84494B15	300
C433M	21-84494B10	190
C433H	21-84494B51	160
C434, 435		NOT USED
C436	21-82428B59	.01 μF +80-20%; 200 V
C437	21-83596E13	.001 μF $\pm 10\%$; 100 V
C438L	21-84494B45	56
C438M	21-84494B24	39
C438H	21-84494B41	24
C439	21-82450B12	2
C440L	21-84494B31	75
C440M	21-84494B44	47
C440H	21-84494B43	39
C441L	21-84494B12	220
C441M	21-84494B46	180 $\pm 3\%$
C441H	21-84494B35	60
C442, 443	21-82428B59	.01 μF +80-20%; 200 V
C444L	21-84494B10	190
C444M	21-84494B04	100
C444H	21-84494B03	80
C445L	21-84494B03	80
C445M	21-84494B45	56
C445H	21-84494B44	47
C446	21-82450B13	1.5
C447	21-83596E13	.001 μF $\pm 10\%$; 100 V
C448L	21-84494B03	80
C448M	21-84494B44	47
C448H	21-84494B42	27
C449L, M	21-84494B07	150
C449H	21-84494B26	110
C450	21-83596E13	.001 μF $\pm 10\%$; 100 V
C451	21-82428B59	.01 μF +80-20%; 200 V
C452L	21-84494B45	56
C452M	21-84494B52	91
C452H	21-84494B33	53
C453L, M	21-84494B12	220
C453H	21-84494B06	120
C454L	21-82450B03	3.9 $\pm 10\%$
C454M	21-82450B32	2.7
C454H	21-82450B17	2.2
C455		NOT USED
C456L	21-84494B25	49
C456M	21-84494B10	34
C456H	21-84494B33	10
C457L	21-84494B52	91

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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C457M	21-84494B02	62
C457H	21-84494B44	47
C458		NOT USED
C459L, 459M	21-84494B41	24
C459H	21-82610C20	82
C460	21-83596E10	220 $\pm 20\%$ (TLB8172A/TLB8173A/TLB8174A)
C460	21-83596E13	.001 μF $\pm 10\%$ (TLB8272A/TLB8273A/TLB8274A)
C461L, 461M	21-84494B04	100
C461H	21-84494B03	80
C462	21-83596E13	.001 μF $\pm 10\%$; 100 V
C463L	21-83596E13	.001 μF $\pm 10\%$; 100 V
C464L	21-808046	15
C464M	21-849335	30
C465, 469	21-83596E13	.001 μF $\pm 10\%$ (TLB8272A/TLB8273A/TLB8274A)
CR401	98-863030	DIODE (SEE NOTE)
CR402, 403		NOT USED
CR404	48-82139G01	germanium
CR401, M	24-81392B12	40 turns on 330 ohm resistor
E301H	24-81392B08	18 turns on 220 ohm resistor
E302L, M	24-81392B11	40 turns on 820 ohm resistor
E102H	24-81392B12	40 turns on 330 ohm resistor
J401		CONNECTOR, receptacle
J402	9-84207B01	7 contacts
L401	24-84389B02	18-2/3 turns; coded BLACK
L402	24-84389B03	18-1/2 turns; coded YELLOW
L403	24-84389B06	8-2/3 turns; coded GREEN
L404, 405, 406	24-84389B05	8-1/2 turns; coded RED
L407L, M	24-84389B07	10-1/2 turns; coded YELLOW
L407H	24-84389B05	8-1/2 turns; coded RED
L408L, M	24-84389B07	10-1/2 turns; coded RED
L408H	24-84389B05	8-1/2 turns; coded RED
L409		NOT USED
L410	24-80900A61	0.62 mH
L411, 412	24-82835G08	2.6 μH ; coded RED-BLUE-GOLD
L413L, M	24-84389B10	12-1/3 turns; coded RED
L413H	24-84389B08	10-1/3 turns; coded BLACK
P401		CONNECTOR, plug
P402	28-84822D01	part of printed circuit board
P403, 902		part of printed circuit board
C439		TRANSISTOR (SEE NOTE)
C401	48-869642	NPN; type M9642
C402, 403		NOT USED
C404	48-869571	PNP; type M9571
C405	48-869534	NPN; type M9534
C406	48-869390	NPN; type M9390
C407, 408	48-869591	NPN; type M9591
R401	6-124C49	1k
R402	6-124A37	50k $\pm 5\%$
R403	6-124A79	18k $\pm 5\%$
R404	6-124A87	39k
or 6-124A89		Factory Selected
R405	6-124A99	47k
or 6-124A98		Factory Selected
R406	6-124A99	120k $\pm 5\%$
R407	6-124B04	180k $\pm 5\%$
R408	6-124C73	10k
R409	6-124C83	27k
R410	18-83083G24	variable; 25k $\pm 30\%$
R411 thru 418		NOT USED
R419 thru 422	6-124A79	18k $\pm 5\%$
R423	6-124C57	2.2k
R424	6-124C89	47k
R425L	6-124C51	1.2k
R425M	6-124C51	1.2k
R425H	6-124C51	3.9k
R426	6-124C47	820
R427	6-124C87	NOT USED
R428L, H	6-124C89	47k
R428M	6-124C57	2.2k
R429	6-124C35	270
R430	6-124C55	33k
R431L, M	6-124C81	22k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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R432	6-124C49	1k
R433L	6-124C91	56k
R433M, H	6-124C89	47k
R434	6-124C37	330
R435	6-124C03	15 $\pm 10\%$
R436	1-80760B23	100 $\pm 5\%$
R437L, M	6-124C25	NOT USED
R438		560
R439H	6-124C43	SYMMETRICAL CLIPPER AND SPREADER FILTER
L401	1-80761B05	pointed unit
NON-REFERENCED ITEMS		
14-861196		INSULATOR, transistor; 2 used (used with Q407 & Q408)
26-83379H01		HEAT SINK; 2 used
26-84598A02		SHIELD, coil; 8 used
42-84284B01		RETAINER; screw, 4 used
3-138162		SCREW, lapping; 4-40 x 3/8"; 4 used (used for mounting retainers)
55-84300B01		HANDLE
1-80767B48		CIRCUIT BOARD ASSEMBLY includes:
29-855943		PN, terminal; .385" lg; 16 used
29-84028H01		PN, terminal; .800" lg.; 19 used
29-84018H02		PN, terminal; .593" lg.; 12 used
39-10184A10		CONTACT, male; .058 x .355"; 10 used
1-80793269		CABLE ASSEMBLY includes:
30-83794C01		CABLE, coaxial; 8" lg. CONNECTOR P402

NOTE:
For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.

REVISIONS			
CHASSIS AND SUFFIX NO.	REF SYMBOL	CHANGE	LOCATION
TLB8172A-1	R435	WAS 6-124C51, 1.2k	PARTS LIST
TLB8173A-1			
TLB8174A-1			
TLB8272A			
TLB8273A			
TLB8274A			
TLB8174A-3	C440H	FROM 21-84494B33, 30 pF TO 21-84494B41, 30 pF	
TLB8174A-1	C441H	FROM 21-84494B37, 140 pF TO 21-84494B35, 60 pF	



5/12/82 - V & G

parts list

TLD5321B Exciter (132-150.8 MHz) = L
TLD5322B Exciter (150.8-174 MHz) = H PL-7116-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
This parts list covers two models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.		
		capacitor, fixed: pF ± 5%; 500 V unless otherwise stated
C401	21-831125	100 ± 10%; 300 V
C402	21-83596E21	.01 uF + 80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22 uF ± 10%; 50 V
C405	21-83596E13	.001 uF ± 10%; 100 V
C406	21-83596E21	.01 uF + 80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ± 20%; 15 V
C409, 410	21-831125	100 ± 10%; 300 V
C411	21-82372C03	0.1 uF + 80-20%; 25 V
C412, 413, 415	21-83596E10	220 ± 20%
C414, 416, 417	21-831125	100 ± 10%; 300 V
C418 thru 421	23-84762H08	3.9 uF ± 20%; 15 V
C422	21-82372C10	.05 uF + 80-20%; 25 V
C423	21-83596E10	220 ± 10%
C424, 425, 426	21-82872C10	.05 uF + 80-20%; 25 V
C427	21-83406D51	3 ± 0.25 pF
C428	21-83406D68	27; 500 V
C429	21-83596E21	.01 uF + 80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B05	120
C431	21-83406D54	4 ± 0.25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B13	240
C433H	21-84494B46	180 ± 3%
C434, 435		NOT USED
C436	21-83596E21	.01 uF + 80-20%; 200 V
C437	21-83596E13	.001 uF ± 10%; 100 V
C438L	21-84494B01	51
C438H	21-84494B24	39
C439	21-861453	1.5 ± 10%
C440L	21-852322	62
C440H	21-868681	47
C441L	21-84494B10	190
C441H	21-861601	130
C442, 443	21-83596E21	.01 uF + 80-20%; 200 V
C444L	21-84493B26	22
C444H	21-83406D55	18
C445	21-82187B45	470 ± 10%
C446	21-82450B37	0.47
C447	21-83596E13	.001 uF ± 10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 uF ± 10%; 100 V
C451	21-83596E21	.01 uF + 80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	18
C454	21-82450B06	0.75 ± 10%
C455		NOT USED
C456L	21-83406D90	11
C456H	21-83406D70	8 ± 0.5 pF
C457	21-83406D89	10 ± 0.5 pF
C458	21-82372C10	.05 ± 20%; 25 V
C459	21-840266	24; NPO
C460	21-83596E10	220 ± 20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 uF ± 10%; 100 V
C464	21-82355B62	1.0
C465		NOT USED
C466	21-82187B06	560
C467	21-82372C10	.05 ± 20%; 25 V
		diode: (see note)
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
		coil, rf:
E401	24-84392B06	40 turns on 820 ohm resistor
E402L	24-84392B13	15 turns on 560 ohm resistor
E402H	24-84392B05	9 turns on 560 ohm resistor
E403L	24-84392G18	40 turns on 10k ohm resistor
E403H	24-82835G08	2.7 uH coded RED-BLU-GLD
		connector, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		coil, rf:
L401	24-84389B02	18-2/3 turns; coded BLK
L402	24-84389B01	18-1/2 turns; coded YEL
L403	24-84389B06	8-2/3 turns; coded GRN
L404	24-84389B05	8-1/2 turns; coded RED
L405	24-84972A33	6-1/2 turns; coded RED

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L406	24-84972A09	6-1/2 turns; coded YEL
L407, 408	24-84972A11	3-1/2 turns; coded GRN
L409		NOT USED
L410	24-80900A61	0.62 mH
L411	24-82835G08	2.6 uH; coded RED-BLU-GLD
L412		NOT USED
L413H	24-84923C01	1-1/2 turns
L413L	24-84923C04	2-1/2 turns
		connector, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		transistor: (see note)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869667	NPN; type M9667
		resistor, fixed: ± 5%; 1/4 W unless otherwise stated
R401	6-124A43	560
R402	6-124A53	1.5k
R403	6-124A79	18k
R404	6-124A87 or 6-124A89	39k (factory selected for DPL models only)
R405	6-124A85 or 6-124A89	33k (factory selected for PL models only)
R406	6-124A99	120k
R407	6-124B04	180k
R408	6-124A73	10k
R409	6-124A83	27k
R410	18-83083G24	variable; 25k ± 30%
R411 thru 418		NOT USED
R419	6-124A79	18k%
R423	6-124A57	2.2k
R424	6-124A85	33k
R425	6-124A51	1.2k
R426	6-124A47	820
R427		NOT USED
R428	6-124A87	39k
R429	6-124A57	2.2k
R430	6-124A35	270
R431	6-124A89	47k
R432	6-124A63	3.9k
R433		NOT USED
R434	6-124A51	1.2k
R435	6-124A15	39
R436	6-125C05	15 ± 10%; 1/2 W
R437	6-124A97	100k
R438	6-124A49	1k
R439L	6-124A49	1k
R439H	6-124A47	820
		symmetrical clipper and splatler filter:
U401	1-80726D74	potted unit

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

non-referenced items		
14-861196	INSULATOR, transistor; 2 req'd. (used with Q407 & Q408)	
26-83379H01	HEAT SINK (used with Q408)	
26-84598A01	SHIELD, coli; 2 req'd. (used with L405, L406)	
26-84598A02	SHIELD, coli; 4 req'd. (used with L401 thru L404)	
26-84250B14	SHIELD, coli; 2 re'd. (used with L407, L408)	
42-84284B01	RETAINER; 4 req'd.	
3-139506	HEX LOCK; 4-40 x 5/8"; 4 req'd. (used for mounting Retainers)	
55-84300B01	HANDLE	
30-83794C01	CABLE, coaxial; 6" req'd. (used with P402)	
29-84028H01	TERMINAL, pin; 19 req'd.	
29-84028H02	TERMINAL, pin; 12 req'd.	
29-855943	TERMINAL, pin; 16 req'd.	
39-10184A10	CONTACT, terminal; 10 req'd.	

parts list

TL05321B Exciter (132-150.8 MHz) = L
TL05322B Exciter (150.8-174 MHz) = H PL-7116-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
This parts list covers two models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.		
		capacitor, fixed: pF ± 5%; 500 V unless otherwise stated
C401	21-831125	100 ± 10%; 300 V
C402	21-83596E21	.01 uF + 80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22 uF ± 10%; 50 V
C405	21-83596E13	.001 uF ± 10%; 100 V
C406	21-83596E21	.01 uF + 80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ± 20%; 15 V
C409, 410	21-831125	100 ± 10%; 300 V
C411	21-82372C03	0.1 uF + 80-20%; 25 V
C412, 413, 415	21-83596E10	220 ± 20%
C414, 418, 417	21-831125	100 ± 10%; 300 V
C418 thru 421	23-84762H08	3.9 uF ± 20%; 15 V
C422	21-82372C10	.05 uF + 80-20%; 25 V
C423	21-83596E10	220 ± 10%
C424, 425, 426	21-82372C10	.05 uF + 80-20%; 25 V
C427	21-83406D51	3 ± 0.25 pF
C428	21-83406D68	27; 500 V
C429	21-83596E21	.01 uF + 80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B06	120
C431	21-83406D54	4 ± 0.25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B13	240
C433H	21-84494B46	180 ± 3%
C434, 435		NOT USED
C436	21-83596E21	.01 uF + 80-20%; 200 V
C437	21-83596E13	.001 uF ± 10%; 100 V
C438L	21-84494B01	51
C438H	21-84494B24	39
C439	21-861453	1.5 ± 10%
C440L	21-852322	62
C440H	21-868681	47
C441L	21-84494B10	190
C441H	21-861601	130
C442, 443	21-83596E21	.01 uF + 80-20%; 200 V
C444L	21-84493B26	22
C444H	21-83406D55	18
C445	21-82187B45	470 ± 10%
C446	21-82450B37	0.47
C447	21-83596E13	.001 uF ± 10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 uF ± 10%; 100 V
C451	21-83596E21	.01 uF + 80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	18
C454	21-82450B06	0.75 ± 10%
C455		NOT USED
C456L	21-83406D90	11
C456H	21-83406D70	8 ± 0.5 pF
C457	21-83406D69	10 ± 0.5 pF
C458	21-82372C10	.05 ± 20%; 25 V
C459	21-840365	24; NPO
C460	21-83596E10	220 ± 20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 uF ± 10%; 100 V
C464	21-82355B62	1.0
C465		NOT USED
C466	21-82187B06	560
C467	21-82372C10	.05 ± 20%; 25 V
		diode: (see note)
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
		coil, rf:
E401	24-84392B06	40 turns on 820 ohm resistor
E402L	24-84392B13	15 turns on 560 ohm resistor
E402H	24-84392B05	9 turns on 560 ohm resistor
E403L	24-84392G18	40 turns on 10k ohm resistor
E403H	24-82835G08	2.7 uH coded RED-BLU-GLD
		connector, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		coil, rf:
L401	24-84389B02	18-23 turns; coded BLK
L402	24-84389B01	18-12 turns; coded YEL
L403	24-84389B06	8-23 turns; coded GRN
L404	24-84389B05	8-12 turns; coded RED
L405	24-84972A33	6-12 turns; coded RED

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L406	24-84972A09	6-12 turns; coded YEL
L407, 408	24-84972A11	3-12 turns; coded GRN
L409		NOT USED
L410	24-80900A61	0.62 mH
L411	24-82835G08	2.6 uH; coded RED-BLU-GLD
L412		NOT USED
L413H	24-84923C01	1-12 turns
L413L	24-84923C04	2-12 turns
		connector, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		transistor: (see note)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869667	NPN; type M9667
		resistor, fixed: ± 5%; 1/4 W unless otherwise stated
R401	6-124A43	560
R402	6-124A53	1.5k
R403	6-124A79	18k
R404	6-124A87 or 6-124A89	39k (factory selected for DPL models only)
R405	6-124A85 or 6-124A89	33k (factory selected for PL models only)
R406	6-124A99	120k
R407	6-124B04	180k
R408	6-124A73	10k
R409	6-124A83	27k
R410	18-83083G24	variable; 25k ± 30%
R411 thru 418		NOT USED
R419	6-124A79	18k%
R423	6-124A57	2.2k
R424	6-124A85	33k
R425	6-124A51	1.2k
R426	6-124A47	820
R427		NOT USED
R428	6-124A87	39k
R429	6-124A57	2.2k
R430	6-124A35	270
R431	6-124A89	47k
R432	6-124A63	3.9k
R433		NOT USED
R434	6-124A51	1.2k
R435	6-124A15	39
R436	6-125C05	15 ± 10%; 1/2 W
R437	6-124A97	100k
R438	6-124A49	1k
R439L	6-124A49	1k
R439H	6-124A47	820
		symmetrical clipper and splatter filter:
U401	1-80726D74	potted unit

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

non-referenced items		
	14-861196	INSULATOR, transistor; 2 req'd. (used with Q407 & Q408)
	26-83379H01	HEAT SINK (used with Q408)
	26-84598A01	SHIELD, coil; 2 req'd. (used with L405, L406)
	26-84598A02	SHIELD, coil; 4 req'd. (used with L401 thru L404)
	26-84250B14	SHIELD, coil; 2 req'd. (used with L407, L408)
	42-84284B01	RETAINER; 4 req'd.
	3-139506	HEX LOCK; 4-40 x 5/8"; 4 req'd. (used for mounting Retainers)
	55-84300B01	HANDLE
	30-83794C01	CABLE, coaxial; 6' req'd. (used with P402)
	29-84028H01	TERMINAL, pin; 19 req'd.
	29-84028H02	TERMINAL, pin; 12 req'd.
	29-855943	TERMINAL, pin; 16 req'd.
	39-10184A10	CONTACT, terminal; 10 req'd.

EXCITER/1ST BANDPASS FILTER

MODEL TLE1720B SERIES

TRIPLER/LOW LEVEL AMPLIFIER

MODEL TLE1600B SERIES

REFERENCE SYMBOL	MOTORC PART N
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PARTS LIST

TLD5491A, AV Exciter (13
TLD5492A, AV Exciter (15

This parts list covers two
Board. Where difference
added to the reference s

C401	21-83112
C402	21-82428
C403	
C404	8-829050
C405	21-83596
C406	21-82428
C407, 408	23-84762
C409, 410	21-83112
C411	21-82372
C412, 413	21-83596
C414	21-83112
C415	21-83596
C416, 717	
C418 thru 421	23-84762
C422	21-82372
C423	21-83596
C424, 425, 426	21-82372
C427	21-83406
C428	21-82133
C429	21-82428
C430L	21-84494
C430H	21-84494
C431	21-83406
C432L	21-84494
C432H	21-84494
C433L	21-84494
C433H	21-84494
C434, 435	
C436	21-82428
C437	21-83596
C438L	21-84494
C438H	21-84494
C439L	21-86145
C439H	21-86451
C440L	21-85232
C440H	21-86868
C441L	21-84494
C441H	21-86160
C442, 443	21-82428
C444L	21-84493
C444H	21-84484
C445L	21-83406
C445H	21-84494
C446	21-82450
C447	21-83596
C448L	21-83406
C448H	21-83406
C449L	21-84493
C449H	21-84494
C450	21-83596
C451	21-82428
C452L	21-83406
C452H	21-83406
C453L	21-83406
C453H	21-83406
C454	21-82450
C455	21-83596
C456L	21-83406
C456H	21-83406
C457	21-83406
C458	21-83596
C459	21-84036
C460	21-83596
C461L	21-84494
C461H	21-84494
C462, 463	21-83596
C464	21-82355
C465	21-82428
C466	21-82610

Motorola No. PEPS-18716-H

(Sheet 1 of 2)

10/5/82 - V & G

EXCITER/1ST BANDPASS FILTER

MODEL TLE1720B SERIES

TRIPLER/LOW LEVEL AMPLIFIER

MODEL TLE1600B SERIES

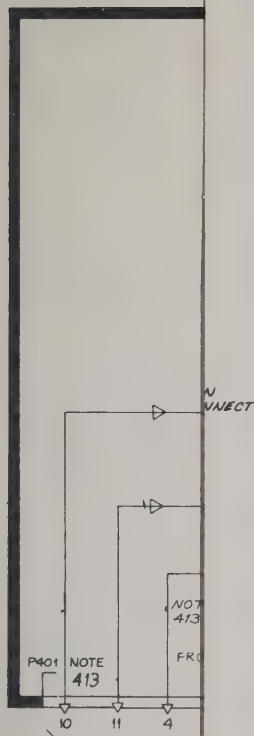


FUNCTION

Exciter — Produces modulated RF signal in 135-171 MHz range.

1st Bandpass Filter — Attenuates signals outside the bandpass range.

Tripler/Low Level Amp. — Triples exciter output frequency and amplifies that signal to drive the following PA.



NOTES

414. THE TRIPLER/LOW LEVEL AMPLIFIER "BOX" IS NOT REPAIRABLE. IF DEFECTIVE, IT MUST BE REPLACED. THIS ALSO APPLIES TO THE 1ST AND 2ND BANDPASS FILTERS.
415. APPLIED TO THE FOLLOWING PA STAGE (OR DRIVER AMPLIFIER OF THE B84RCB MODEL SERIES).

CEPS-17178-C

2nd Bandpass Filter Note 410		
A	TFE6153A	TFE6154A TFE6155A
	X	
		X
		X

Motorola No. PEPS-18716-H
(Sheet 2 of 2)
10/5/82 - V & G

EXCITER/1ST BANDPASS FILTER
TRIPLER/LOW LEVEL AMPLIFIER

EXCITER/1ST BANDPASS FILTER

MODEL TLE1720B SERIES

TRIPLER/LOW LEVEL AMPLIFIER

MODEL TLE1600B SERIES

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

LEGEND

L = 132-150.8 MHz
H = 150.8-174 MHz

TL D5491A, AV Exciter (132-150.8 MHz)

PL-4122-F

This parts list covers two models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.

		CAPACITOR, fixed; pF ±5%; 500 V; unless otherwise stated
C401	21-831125	100 ±10%; 300 V
C402	21-82428B59	0.01 µF ±80-20%; 200 V
C403		NOT USED
C404	8-82905011	.22 µF ±10%; 50 V
C405	21-83596E13	0.01 µF ±10%; 100 V
C406	21-82428B62	0.01 µF ±80-20%; 200 V
C407, 408	23-84762H08	3.9 µF ±20%; 15 V
C409, 410	21-831125	100 ±10%; 300 V
C411	21-82372C03	0.1 µF ±80-20%; 25 V
C412, 413	21-83596E10	220 ±20%
C414	21-831125	100 ±10%; 300 V
C415	21-83596E10	220 ±20%
C416, 717		NOT USED
C418 thru 421	23-84762H08	3.9 µF ±20%; 15 V
C422	21-82372C04	.05 µF ±80-20%; 25 V
C423	21-83596E10	220 ±20%
C424, 425, 426	21-82372C04	.05 µF ±80-20%; 25 V
C427	21-83406D51	3 ±20, 25 pF
C428	21-82133G06	3.9 µF ±20%
C429	21-82428B62	.01 µF ±80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B06	120
C431	21-83406D54	4 ±0, 25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B10	240
C433H	21-84494B46	180 ±3%
C434, 435		NOT USED
C436	21-82428B62	.01 µF ±80-20%; 200 V
C437	21-83596E13	0.01 µF ±10%; 100 V
C438L	21-84494B01	51
C438H	21-84494B24	39
C439L	21-861453	1.5 ±10%
C439H	21-864518	1 ±10%
C440L	21-852322	62
C440H	21-868681	47
C441L	21-84494B10	190
C441H	21-861601	130 ±3%
C442, 443	21-82428B59	.01 µF ±80-20%; 200 V
C444L	21-84493B27	51; 200 V
C444H	21-84484B24	39
C445L	21-83406D91	40
C445H	21-84494B30	34
C446	21-82450B06	0.75 ±10%
C447	21-83596E13	.001 µF ±10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 µF ±10%; 100 V
C451	21-82428B62	.01 µF ±80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	15
C454	21-82450B06	0.75 ±10%
C455	21-83596E13	.001 µF ±10%; 100 V
C456L	21-83406D90	10
C456H	21-83406D70	8 ±0.5 pF
C457	21-83406D89	10 ±0.5 pF
C458	21-83596E13	.001 µF ±10%; 100 V
C459	21-840365	24; NPO
C460	21-83596E10	220 ±20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 µF ±10%; 100 V
C464	21-82558B62	62
C465	21-82428B59	.01 µF ±80-20%; 200 V
C466	21-82610C23	6.8 ±.5%; 200 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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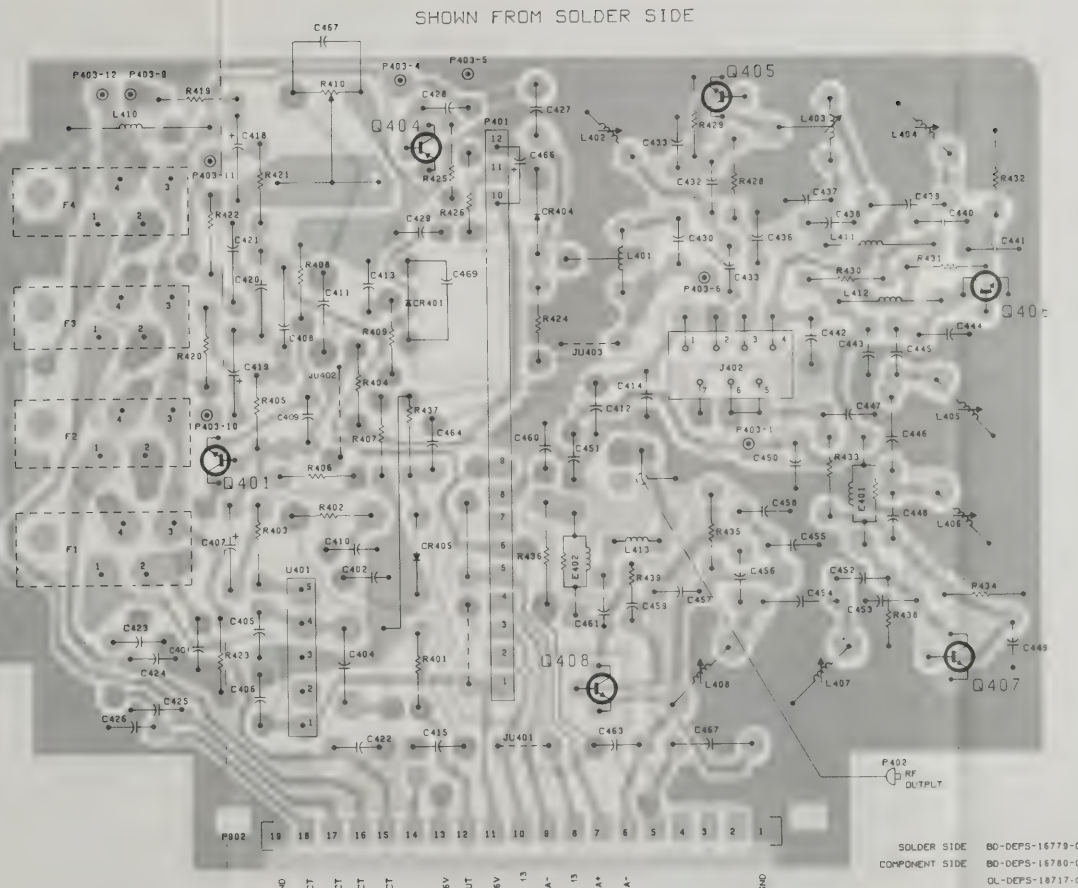
C467	21-82187B07	470 \pm 10%
C468	21-82208B28	400 μ F \pm 10%; 200 V
C469	21-82187B06	560
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
E401	24-84392B06	COIL, r.f.
E402L	24-84392B13	40 turns on 820 ohm resistor
E402H	24-84392B05	15 turns on 560 ohm resistor
		9 turns on 560 ohm resistor
F401		CONNECTOR, receptacle:
F402	9-84207B01	NOT USED
		7 contacts
L401	24-84389B02	COIL, r.f.
L402	24-84389B01	18-2 1/2 turns; coded Black
L403	24-84389B06	18-1 1/2 turns; coded Yellow
L404	24-84389B05	8-2 3/4 turns; coded Green
L405, 406	24-84389B05	8-1 1/2 turns; coded Red
L407, 408	24-84972A09	6-1 1/2 turns; coded Yellow
L409	24-84972A11	3-1 1/2 turns; coded Green
L410	24-80900A61	NOT USED
L411, 412,	24-82835G08	0.6 mH
L413	24-84923C01	2 \pm 4% of coded Red-Blue-Gold
		1-1/2 turns
P401		CONNECTOR, plug:
P402	28-84282D01	part of printed circuit board
P403, 902		phone
		part of printed circuit board
Q401		TRANSISTOR; (SEE NOTE)
Q402, 403		NPN; type M9642
C404	48-869571	NOT USED
C405	48-869534	PNP; type M9571
C406	48-869530	PNP; type M9534
C407, 408	48-869567	PNP; type M9390
		PNP; type M9867
		RESISTOR, fixed: \pm 5%; 1/4 W
		unless otherwise stated
R401	6-12A443	500 ohms
R402	6-12A453	1.5k
R403	6-12A479	18k
R404	6-12A487	39k
	or 6-12A489	47k
R405	6-12A495	33k
	or 6-12A489	47k
R406	6-12A499	120k
R407	6-12A504	180k
R408	6-12A473	10k
R409	6-12A481	22k
R410	18-83083G24	variable: 25k \pm 30%
R411 thru 418		NOT USED
R419 thru 422	6-12A479	18k
	6-12A457	2.2k
R424	6-12A485	33k
R425	6-12A451	1.2k
R426	6-12A447	820 ohms
R427		NOT USED
R428	6-12A487	39k
R429	6-12A457	2.2k
R430	6-12A435	270 ohms
R431	6-12A489	47k
R432	6-12A463	3.9k
R433		NOT USED
R434	6-12A439	390 ohms
R435L	6-12A409	22 ohms
R435H	6-12A415	39 ohms
R436	6-12A405	15 \pm 1/2 W
R437	6-12A494	82k
R438	6-12A449	1k
R439L	6-12A449	1k
R439H	6-12A441	470 ohms
		SYMMETRICAL CLIPPER AND
		SPREADER FILTER:
U401	1-80726D74	potted unit

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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NON-REFERENCED ITEMS	
14-861196	INSULATOR, transistor; 2 req'd, (used with Q407 & Q408)
20-33791H01	HEAT SINK (used with Q408)
26-84598A01	SHIELD, coil; 4 req'd. (used with L405 thru L408)
26-84598A02	SHIELD, coil; 4 req'd, (used with L401 thru L404)
42-84284B01	RETAINER; 4 req'd.
3-139506	SCREW, tapping, Phillips round hd., 4-40 x 5/16" 4 req'd, (used for mounting Retainers)
55-84300B01	HANDLE
30-83794C01	CABLE, coaxial; 6' req'd, (used with P402)
29-84028H01	TERMINAL, pin; 19 req'd.
29-84028H02	TERMINAL, pin; 12 req'd.
29-855943	TERMINAL, pin; 16 req'd.
39-10184A10	CONTACT, terminal; 10 req'd.

NOTE: For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.

REVISIONS				FEPS-1874-D
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	
TLD5491A TLD5492A	R428	FROM 6-124C85; 33k TO 6-124C87, 39k	PARTS LIST	
	R431	FROM 6-124C97, 100k TO 6-124C94; 82k		
	C466	FROM 21-62428R2R, 500 μ F; \pm 10%; 500 V TO 21-826 10C23, 6.8 μ F; \pm 5%; 200 V		
P104, R405		ALTERNATE 6-124A89 47k \pm 5% 1/4 W ADDED	PARTS LIST	
	R400	FROM 6-124C88, 27k TO 6-124C11	Meter 1	



SOLDER SIDE	80-DEPS-16779-0
COMPONENT SIDE	80-DEPS-16780-0
	QL-DEPS-18717-0

Motorola No. PEPS-18716-H
(Sheet 1 of 2)
10/5/82 - V & G

EXCITER/1ST BANDPASS FILTER

MODEL TLE1720B SERIES

TRIPLER/LOW LEVEL AMPLIFIER

MODEL TLE1600B SERIES

FUNCTION

Exciter — Produces modulated RF signal in 135-171 MHz range

1st Bandpass Filter — Attenuates signals outside the bandpass range.

Tripler/Low Level Amp. — Triples exciter output frequency and amplifies that signal to drive the following PA.

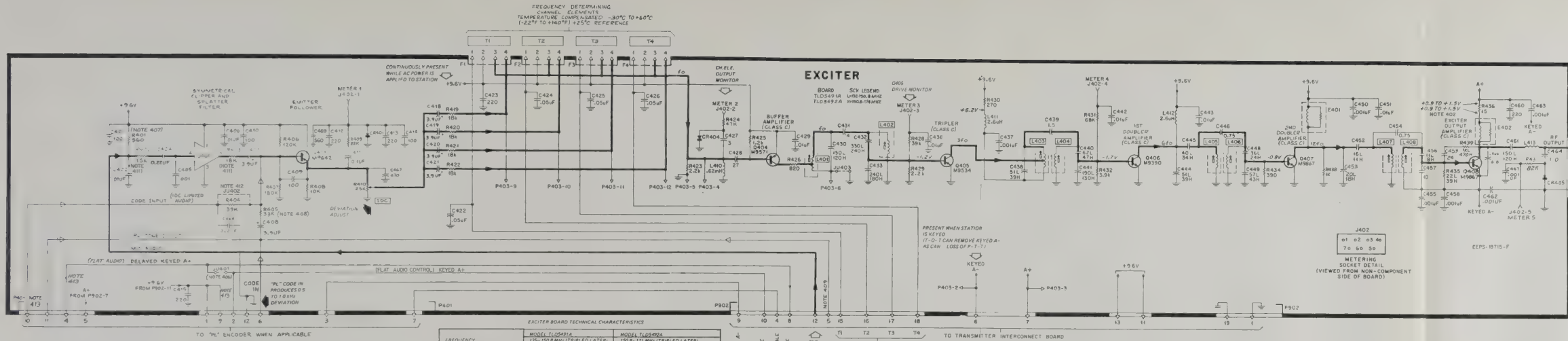
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Motorola No. PEPS-18716-H

(Sheet 2 of 2)

10/5/82 - V & G

EXCITER/1ST BANDPASS FILTER
TRIPLER/LOW LEVEL AMPLIFIER



1ST BANDPASS FILTER

TLE1600B
TLE1600A
TLE1600C
TLE1600D

RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

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RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

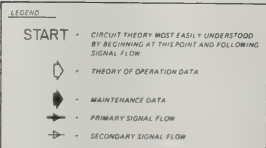
RF OUTPUT TO TRANSMITTER INTERCONNECT BOARD

EXCITER BOARD TECHNICAL CHARACTERISTICS	
MODEL TLE1720B	MODEL TLE1600B
FREQUENCY	135-171 MHz (TRIPLED LATER)
NUMBER OF CHANNELS	1 TO 4
MAXIMUM FREQUENCY SEPARATION	2500 MHz
DEVIATION	±14.5 MHz
FREQUENCY MULTIPLICATION	12 TIMES
OUTPUT POWER	400 MILLIWATTS (OUT OF 1ST BANDPASS FILTER)
OUTPUT IMPEDANCE	50 OHMS
MODULATION TYPE	DIRECT FM CHANNEL ELEMENTS
DEVIATION	±14.5 MHz (ADJUSTABLE INSTANTANEOUS DEVIATION LIMITING)
AUDIO RESPONSE	6 dB OCTAVE PRE-EMPHASIS 300 TO 3000 Hz
AUDIO SENSITIVITY	1.0 MILLIVOLTS (300 TO 3000 Hz) DEVIATION
AUDIO DISTORTION	LESS THAN 3% AT 135 kHz DEVIATION FROM 300 TO 3000 Hz
POWER REQUIREMENTS	REGULATED 9 VOLT DC (9 VOLT BATTERY) 100 MA
METERING	FIVE TEST POINTS CRITICAL TO OPERATION AND ALIGNMENT ARE ACCESSIBLE AT A METERING RECEPTACLE WHICH PERMITS TESTING WITH AN OPTIONAL BUILT-IN STATION METER (NOT ON A PORTABLE TEST SET OR 50-μA MICROAMMETER WITH 2,000 OHMS INTERNAL RESISTANCE) (SEE THE BUILT-IN STATION METERING ON THE BOARD MODEL SERIES STATIONS)
FREQUENCY CALCULATION	$f_o = 12 f_c$ $f_c = 26 f_o$ $f_o = \frac{1}{12}$ or $\frac{1}{26}$ $f_o =$ CARRIER FREQUENCY $f_c =$ OSCILLATOR CRYSTAL FREQUENCY $f_o =$ EXCITER OUTPUT FREQUENCY

NOTES:

- Frequency calculations given in accompanying technical characteristics table. Note that output of exciter is 12th, and not final carrier frequency. A following tripler stage multiplies exciter output to the carrier frequency.
- Voltage measured across R438.
- High Impedance transistorized voltmeters (11 megohm) not recommended.
- Unless otherwise stated, voltages measured in respect to chassis ground.
- Unless otherwise stated, capacitor values are in picofarads.
- JU401 removed in Private-Line and PURC paging radios.
- R401 removed in remote control stations.
- Remove R405 unless code inputs are applied via P401-6 or P902-5.
- In Private-Line radios, P902-5 is not connected to the transmitter interconnect board.
- The tripler/low level amplifier "box" is not replaceable. If defective, it must be replaced. This also applies to the 1st and 2nd bandpass filters.
- R402 and R403 removed when flat audio board is used.
- JU402 added when flat audio board is used.
- When PL squelch is used, signal name of P401-10 is Code Input; P401-4 and P902-8 is Delayed Keyed A+; P401-2 and P902-10 is Keyed A+.

When flat audio board option is used, signal name of P401-10 is IDC Limited Audio; P401-4 and P902-8 is Flat Audio; P401-2 and P902-10 is Flat Audio Control.



Model Complement	
Assembly	Consists of
Exciter 1st Bandpass Filter	1st Bandpass Filter Note 410
Exciter 1st Bandpass Filter	Exciter Board
TLE1721B (406-420 MHz)	TLE16037A TLE16037A TLE16037A TLE16037A TLE16037A TLE16037A
TLE1723B (450-470 MHz)	X X X X X X
TLE1724B (470-494 MHz)	X X X X X X
TLE1725B (494-512 MHz)	X X X X X X

Model Complement	
Assembly	Consists of
Tripler/Low Level Amplifier	Tripler/Low Level Amplifier Note 410
Tripler/Low Level Amplifier	2nd Bandpass Filter Note 411
TLE1601B (406-420 MHz)	TLE16050B TLE16050B TLE16050B TLE16050B TLE16050B TLE16050B
TLE1603B (450-470 MHz)	X X X X X X
TLE1604B (470-494 MHz)	X X X X X X
TLE1605B (494-512 MHz)	X X X X X X

**MOTOROLA INC.**Communications
Sector**PAGING SYNTHESIZER**

MODELS: TLB1562A 30-36 MHz
 TLB1563A 36-42 MHz
 TLB1564A 42-50 MHz
 TLD2593A 150-174 MHz
 TLE2273A 450-512 MHz

PERFORMANCE SPECIFICATIONS

Frequency Stability	
With HSO (High Stability Osc)	Same as HSO ($\pm .02$ ppm)
Without HSO	± 2 ppm -30 to -60°C
Supply Voltage Requirements	$+13.8$ V dc $\pm 20\%$
Supply Current Drain	500 mA, maximum
Spurious and Harmonic Emissions	More than 85 dB below carrier
FM Noise	
With EIA Pre-emphasis	55 dB
With Flat Audio	40 dB
Audio Response	± 0.5 dB; 300 Hz to 3 kHz
Audio Harmonic Distortion	Less than 1% at ± 3 kHz
Audio Sensitivity	
Low Band	3 V to 4 V p-p for ± 5 kHz at 1 kHz
Other Bands	2 V to 3 V p-p for ± 5 kHz at 1 kHz
DC Deviation Range at F_c	± 3 kHz to ± 5 kHz
Data Deviation Range at F_c	± 3 kHz to ± 5 kHz
Data/Voice Mode Transient	Less than 100 Hz peak
Data Rise Fall Time	Less than 400 usec
RF Output	0.3 V rms to 1 V rms
Frequency Ranges:	
Low Band 30-50 MHz	10.0 to 16.666 MHz
High Band 150-174 MHz	12.5 to 14.5 MHz
VHF 450-512 MHz	12.5 to 14.222 MHz
900 MHz 928-960 MHz	12.888 to 13.333 MHz

PAGING SYNTHESIZER INTERFACE REQUIREMENTS

HSO Supply Voltage	24 V dc $\pm 10\%$
HSO Power Consumption	11 watts, max.
Synthesizer Supply Voltage	13.8 V dc $\pm 20\%$
Synthesizer Current Drain	500 mA dc
HSO RF Level	More than 1.0 V rms @ 50 ohms
Synthesizer RF Output Level	More than 0.3 V rms into cable terminated by exciter
Audio Input Level	More than 4 V peak to peak @ 1 kHz
Data Levels	"1" — More than 4 V "0" — Less than 0.7 V
Data Enable Levels	Enable — More than 7 V Disable — Less than 0.7 V
RF Enable Input	Enable — Less than 0.7 V (I Source = 4 mA) Disable — More than 9 V
Out of Lock Indicate	Isink less than 4 mA dc
Synthesizer Metering	TEK-5 or equivalent

PAGING SYNTHESIZER

technical writing services

PAGING SYNTHESIZER

MODEL CHART

CODE:

● = ONE ITEM SUPPLIED

[illegible]

EPS-34980-O

1. GENERAL DESCRIPTION

The paging synthesizer is a standard 19" rack mounted unit designed for use in Motorola *Micor* Paging Base Stations. The paging synthesizer provides a modulated rf signal to drive the exciter. Modulation can be either analog (voice and tones) or digital (binary paging codes or equivalent). Digital modulation including dc is made possible by the technique of dual-port modulation, where dc and low frequency data components are controlled by the digital modulation circuit. The higher frequency components of modulation (greater than 1 Hz) are accommodated by direct frequency modulation (fm) of the synthesizer voltage controlled crystal oscillator (VCXO or channel element). The paging synthesizer also provides high frequency stability by optional phase-locking to 100 kHz, 1 MHz, 5 MHz (standard) or 10 MHz high stability reference oscillators. Refer to the voltage regulator board and paging synthesizer schematic and block diagrams for the following descriptions. Figures 1 and 2 show component location and the solder side shield location.

2. FUNCTIONAL BLOCK DESCRIPTIONS

2.1 9.6 V AND 5 V REGULATORS (Refer to PEPS-34965 for details)

2.1.1 The 9.6 V regulator consists of a series pass transistor (Q400) which is driven by the regulator integrated circuit (U400). The regulated 9.6 V dc is provided to all analog and rf circuits, and is derived from the station 12 V dc supply (typically 13.6 V dc).

2.1.2 The 5 V regulator is derived from the regulated 9.6 V dc supply, and provides regulated 5 V dc to all logic circuits requiring 5 V dc. The 5 V regulator consists of a 3-terminal integrated circuit (U401).

2.2 REFERENCE AMPLIFIER AND SWITCH (Q24, Q23) (Refer to Paging Synthesizer diagrams PEPS-34989 for details)

The reference amplifier and switch amplify the high stability oscillator signal to the proper logic levels and shape, for application to integrated circuits U14 and U16.

2.3 REFERENCE DIVIDER (U14, U15, U16)

The reference divider divides the High Stability Oscillator (HSO) frequency down to 100 kHz for use in phase locking U18, the 14.4 MHz oscillator. HSO frequencies of 100 kHz, 1 MHz, 5 MHz, or 10 MHz can be programmed by jumpers JU20 and JU21.

2.4 REFERENCE PHASE DETECTOR (U17)

One section of U17, (quad exclusive-OR gate) is used as a reference phase detector. The output consists

of pulses at 200 kHz, (twice the input frequency) having a width dependent on the phase error between the two input signals to U17.

2.5 REFERENCE LOOP FILTER (Q22 with associated circuitry)

Q22 amplifies the output pulses of U17 to approximately 8 volts peak-to-peak. R61, C62, R60, and C61 form an integrator circuit which recovers the dc value of Q22 output pulses, for use in controlling the frequency of U18 (14.4 MHz voltage controlled crystal oscillator, VCXO).

2.6 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (U18)

U18 is a 14.4 MHz voltage controlled crystal oscillator which is phase-locked to the HSO. The output of U18 is used to provide one of the phase detector (U17) inputs, and also provide an input to the digital modulator circuitry (U11).

2.7 REFERENCE LOOP AMPLIFIER (Q21, Q20, Q19)

The reference loop amplifier amplifies U18 output signal to the proper logic levels and shape for application to U19 (reference loop divider) and U11 (digital modulator).

2.8 REFERENCE LOOP DIVIDER (U19, U20)

Reference loop dividers U19 and U20 divide the output frequency of Q19 by 144. This is the 100 kHz feedback signal to the phase detector (U17), which is compared in phase to the 100 kHz signal derived from the HSO.

2.9 DIGITAL MODULATOR (U9, U10, U11, U12, U13)

2.9.1 This circuit frequency modulates the output signal of Q19 to the "one" and "zero" frequencies upon command of the pulse insertion oscillator, integrated circuit dividers U5 through U8.

2.9.2 Pulse insertion results in positive deviation by inserting extra pulses into the 14.4 MHz pulse train at the appropriate rate. This takes place in integrated circuit U12 (exclusive-OR gate with the input on pins 4 and 5; output on pin 6).

2.9.3 Pulse blanking, similarly, creates negative deviation by blanking pulses from the 14.4 MHz pulse train at the appropriate rate. This occurs in integrated circuit U11 (input pins 12 and 13, output pin 11).

2.9.4 Pulse insertion is selected upon command by a data enable and a data "one". Pulse blanking is

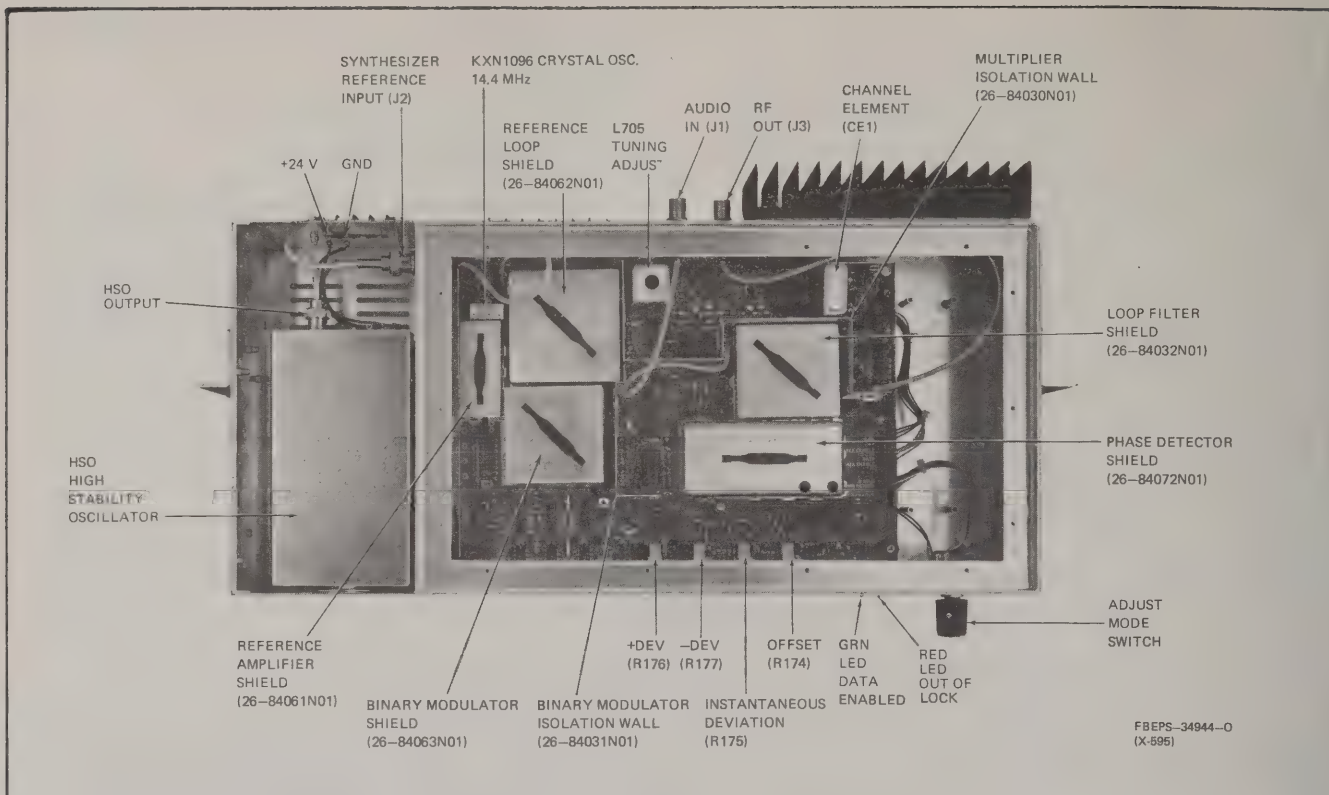


Figure 1. Paging Synthesizer Component Location

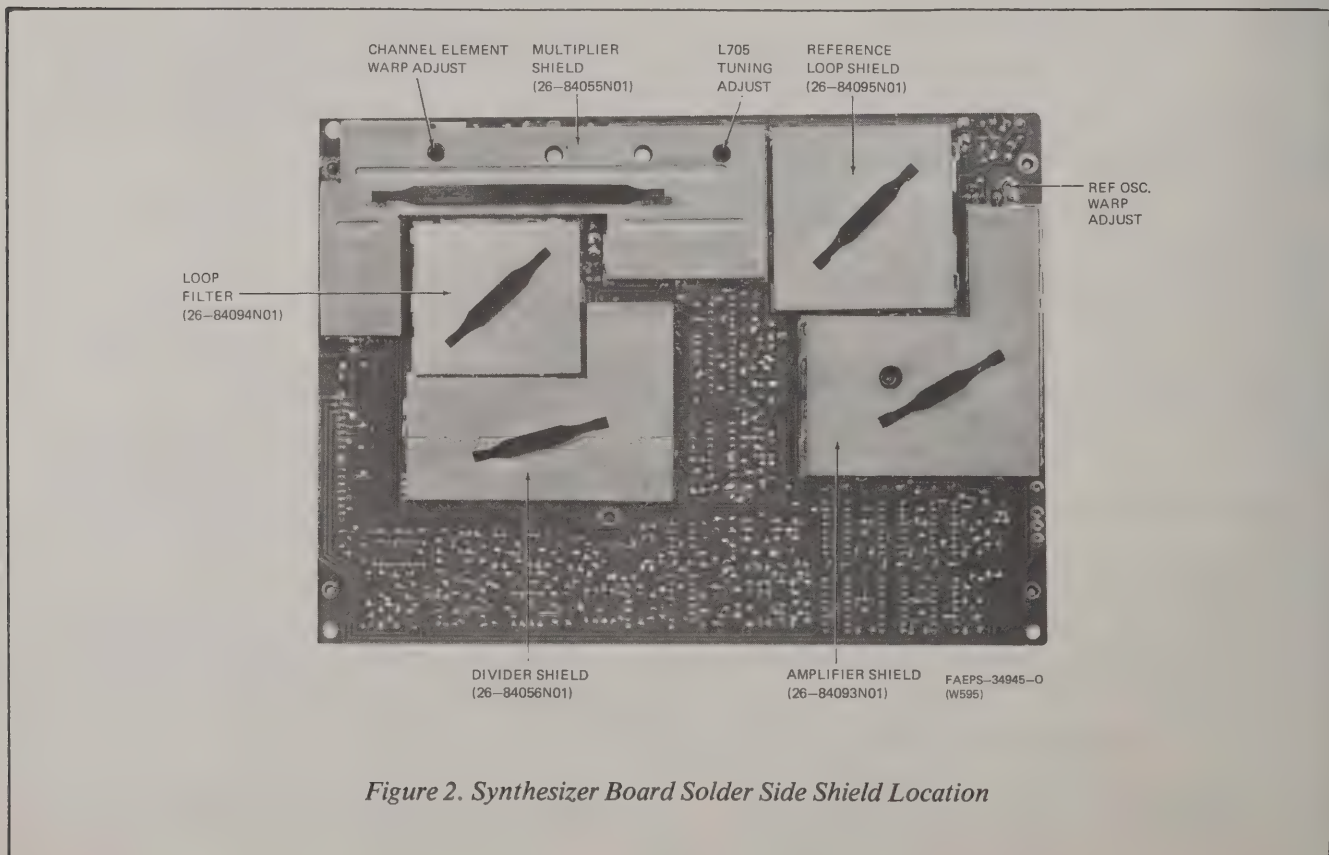


Figure 2. Synthesizer Board Solder Side Shield Location

selected upon command by a data enable and a data “zero”. The appropriate rate of insertion pulses or blanking pulses is determined by the following formula:

$$R = \frac{\text{Deviation} \times 14.4 \text{ MHz}}{\text{Carrier Frequency (MHz)}}$$

The frequency modulated 14.4 MHz is divided by two to 7.2 MHz, by U13 (input pin 11, output pin 9) and serves as the reference input for the main synthesizer loop phase detector U602.

2.10 PULSE INSERTION OSCILLATORS AND DIVIDERS (U1 and U3-U8)

U1 is a dual timer which serves as two independent RC oscillators. The outputs are frequency divided by U3 through U8 to obtain the pulse insertion and blanking rates mentioned in paragraph 2.9. These are necessary for (+) and (–) data deviation of the 14.4 MHz signal. R176 and R177 are precision potentiometers for setting the “one” and “zero” (or + and –) deviations respectively. In order to obtain the proper deviation's, jumpers JU1 through JU18 which set the divider ratios, must be properly installed.

2.11 MAIN LOOP DIVIDER (U602), ROM (U604)

2.11.1 U602 is an integrated circuit which is used to divide the 7.2 MHz reference input (pin 2) to either 2.0833 kHz or 2.500 kHz output (pin 5) depending on the frequency band (900 MHz, UHF, HB, or LB respectively). The internal $\div 63/\div 64$ prescaler is driven by U601 and in turn drives the A and B dividers internally. The choice of 2.0833 kHz, or 2.500 kHz, and the numbers programmed into the A and B dividers are stored in U604 and called out on “D” lines (U604-12,11,10,9) by U602 addressing the “A” lines U604-5,6,7.

2.11.2 The A and B dividers provide the loop output at 2.0833 kHz or 2.500 kHz (U602-9). This frequency is derived from the channel element (CE1). U602 pin 9 is also used to signal the $\div 3/\div 4$ prescaler (U601) when to divide by 4 rather than 3. The $\overline{C0}$ and $\overline{C1}$ lines (pins 15 and 16) signal to U601 how many times to divide by 4 rather than 3. This information is stored in U604 ROM and (like A and B divider programs) differs from channel to channel.

2.12 SAMPLE AND HOLD PHASE DETECTOR (U603)

Integrated circuit U603 is used to compare the two divider IC output phases (2.0833 kHz or 2.500 kHz depending on the frequency band). It ultimately generates an output signal on pin 15, which after further filtering and amplification, is used to control the frequency of the channel element (CE1).

2.13 LOOP DC AMPLIFIERS (U609, U21) LOOP FILTERS, AND LOOP SUMMERS (U21)

2.13.1 U609 is a dc amplifier with a gain of approximately 11; this amplifies the output signal from U603 and applies it to the loop filter.

2.13.2 The loop filter is composed of R122, R123, C23, C24, and C28. It is a standard lead-lag filter and results in a loop bandwidth of about 1/2 Hz, with a damping factor of approximately 0.65. These parameters determine the cross-over between pulse insertion/blanking modulation, and the modulation summed in this loop is approximately 1 Hz.

2.13.3 The first loop summer (U21-8,9,10) adds binary modulation to the loop dc control voltage and amplifies the data amplitude by a factor of 2. Following the first loop summer is a 3 kHz passive RC low pass filter (R79, R78, R77, C74, C75, and C76), which has no effect on the dc control voltage, but shapes the data modulation to prevent excessive modulation sideband splatter. This filter is buffered by unity gain amplifier Q25, Q26.

2.13.4 U21 pins 2 and 3 is the second loop summer which is used to sum voice or tone modulation with the loop dc control voltage. For modulation, it has a voltage gain of unity; for the loop signals, it has a voltage gain of two. The output (pin 1) is applied directly to the channel element (CE1) modulation port (pin 4). This controls the channel element frequency so that it is phase locked to the 7.2 MHz output of the digital modulator circuit, and also directly frequency modulates it with voice or tones, or splatter filtered data.

2.14 CHANNEL ELEMENT (CE1)

The channel element serves as the voltage crystal oscillator (VCO) in the main synthesizer loop, and provides an output signal between 10 and 16-2/3 MHz. The output signal is amplified and drives the exciter in the transmitter portion of the base station.

2.15 EXCITER AMPLIFIER/BUFFER SWITCH (Q701, Q36, Q37, CR1, CR2)

Q701 amplifies the output of channel element (CE1) to the proper level to drive a base station exciter. Q36 and Q37 buffer the output of Q701 to prevent loading by the coaxial cable used to connect it to the base station exciter. CR1 and CR2 PIN diodes used in a series-shunt rf switch greatly attenuate the signal delivered to the base station exciter, if rf enable is a high level dc signal. The output of the synthesizer (Q36 and Q37 emitters) is frequency multiplied in the base station, just as a normal channel element signal would be: $\times 3$ for low band, $\times 12$ for high band, $\times 36$ for UHF, and $\times 72$ for 900 MHz.

2.16 FREQUENCY MULTIPLIERS (Q706, Q702, Q703, Q704) AND BUFFER (Q40)

2.16.1 For low band models, Q702 and Q703 are not used. Q706 is a unity gain amplifier, and Q704 and associated components form a frequency tripler. The output of Q704 is limited in amplitude by CR6 and CR7, buffered by Q40 before being applied to U601 pin 1 (divide by 3; divide by 4 prescaler).

2.16.2 For all other models, Q706 is a unity gain buffer, Q702 is a frequency tripler, and Q703 and Q704 are both frequency doubling stages. The overall frequency multiplication is a factor of 12. CR6, CR7, and Q40 are as described before. Low band and the other frequency bands differ so that the phase detector input frequencies may remain reasonably high and still achieve the desired channel spacings.

2.17 PRESCALER $\div 3 / \div 4$ (U601)

2.17.1 U601 is normally used to allow synthesizer operation from a 400 MHz or higher voltage controlled oscillator. In this paging synthesizer the highest frequency from Q40 is 174 MHz. U601 used in this application with frequency multipliers, allows all of the desired channel spacings to be achieved without resorting to excessively low phase detector (U603) input frequencies.

2.17.2 $\overline{C0}$ and $\overline{C1}$ (U601 pins 7 and 6) receive instructions from U604 via U602 as to how many cycles of its operation U601 should be in the divide by 4 mode during a loop pulse period (loop pulse is signaled from U602 pin 9 to U601 pin 5). In this manner an assortment of non-integer divisors are achieved. The total frequency divisor from CE1 pin 3 to U602 pin 9 is:

$$\begin{aligned}\text{Low Band: } N_T &= \frac{3(64A + 63B) + C}{3} \\ \text{Other Bands: } N_T &= \frac{3(64A + 63B) + C}{12}\end{aligned}$$

Where A and B are U603 divider programs, and C is the U601 program.

2.18 LOSS OF LOCK DETECTOR (U606, U607)

The loss of lock detector consists of two voltage comparators (both within U606); a reference loop detector and a main loop detector. The outputs of these are combined in U607, a quad OR-gate. The output of U607 is dc amplified by Q39, stored in delay capacitor C93, and used to inhibit transmitter keying by Q33 in the event of loss of lock. The delay time constant C93, R164 are used to prevent false transmission during acquisition of lock or other transient or oscillatory conditions. Q32 drives DS3 which provides a visual indication for out of lock condition.

2.19 BINARY MODULATOR (Q3-5, Q9-14, Q31, Q42, Q43, U22)

2.19.1 The binary modulator performs two functions:

First, it translates data levels to precisely the peak-to-peak voltage level necessary for modulation of the main synthesizer loop via U21 pin 10. This is adjustable via R174. Secondly, it provides a dc level which is superimposed on the data applied to U21 pin 10. This level is adjustable (in the data enable mode) by R175. This dc level is necessary for the following conditions:

- To change the data levels, so they are symmetrical about the main loop dc control voltage for equal plus and minus frequency deviations.
- To change the data levels so they are not symmetrical about the main loop dc control voltage for unequal plus and minus frequency deviations, if desired.

Q3,4,9,13, and 14 perform the first condition by switching R174 to either a fixed high level voltage (data "1") or a fixed low level voltage (data "0"). R174 is switched by either Q13 or Q14, but not both simultaneously. The resistance setting of R174 along with fixed resistors R137 and R134 determine the voltage amplification of op. amp. U22 for the data levels.

2.19.2 The circuit composed of Q5, Q31, Q42, and Q43 connects R175 into the circuit in the data enable mode. Switching transistors Q42 and Q43 are both on at the same time thus connecting R175 between regulated 9.6 V dc and ground. The voltage setting of R175 provides the adjustable dc level function mentioned above in the data enable mode. This voltage is summed with the data in the op. amp. U22 via R133 and R134 which provides unity gain for this level. DS2 provides a visual indication of the data enable mode.

2.20 DATA SIMULATOR (U23)

2.20.1 This circuit provides a simulated 300 bps data stream which, when selected by the rotary switch S1 (INSTANTANEOUS DEVIATION ADJUST position) on the synthesizer panel allows the peak-to-peak data deviation to be set using R174.

2.20.2 In the OFFSET ADJUST mode of rotary switch S1, a simulated data stream and a pulsating data enable are available. This allows for a convenient setting of the data bias, R175, by adjusting for minimum frequency transient upon change of data enable states (voice/tone to data, and vice versa). Final adjustment of R174 and R175 cannot be made until the +DEV (R176) and -DEV (R177) controls are set. The rotary switch must always be returned to the normal (OPERATE) position after servicing the station. An ADJUST MODE LED (DS3) is provided to indicate if the switch is not in the OPERATE mode.

2.20.3 U23 is a self contained RC oscillator and frequency divider. Oscillation of U23 is controlled by R139, R140, and C81. The frequency of oscillation determines the rate of the simulated data stream. Q34 buffers the simulated data for application to the binary modulator through the rotary switch when selected. U23 further frequency divides the oscillation frequency to provide a simulated pulsating data enable signal of approximately 1.5 Hz. This circuit is included as an aid to servicing and alignment, and is not normally activated during system operation.

3. SUMMARY

The paging synthesizer allows analog or digital (binary) modulation of paging base stations including low band, high band, and UHF. It not only provides dc modulation capability, but high stability transmitter frequency at the same time; this is necessary for simulcast system applications.

4. ALIGNMENT PROCEDURE

4.1 GENERAL

Monitor the transmitter output frequency with an adequate frequency counter (typically accurate to ± 1 Hz). The transmitter modulation should be monitored with a Motorola Service Monitor (R1200) with a deviation meter or equivalent.

4.2 MULTIPLIER

(Use a Motorola TEK-5 or equivalent metering panel.)

Step 1. Low Band — Peak L705 on Meter 3.

Step 1A. Other Bands —

- Peak L703 on Meter 1
- Peak L704 on Meter 2
- Peak L705 on Meter 3

Step 2. Repeat Step 1A.

4.3 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (VCXO)

Adjust U18 warp coil (located through small hole on top of chassis, (see Figure 3) for $1.5 \text{ V} \pm 0.1 \text{ V}$ dc at test point 1 (junction of C82 and R150). A high resistance voltmeter (11 megohm, R1002 or equivalent) must be used.

4.4 CHANNEL ELEMENT (CE1)

Step 1. Set the adjust mode switch on the synthesizer to the OPERATE mode. **DO NOT** apply any modulating signals.

Step 2. Set CE1 warp capacitor for $4.7 \text{ V} \pm 0.3 \text{ V}$ dc at test point 2 (junction of R151 and C83). Use a high resistance voltmeter as before. Refer to Figure 3 for location of tuning hole.

4.5 HIGH STABILITY OSCILLATOR (HSO)

The high stability oscillator (Y1) should be allowed to warm up for at least 30 minutes before proceeding any further. This is necessary for the oven in the oscillator to reach its operating temperature.

Step 1. Key the transmitter.

Step 2. Adjust the HSO to the assigned transmitter output frequency ± 10 Hz.

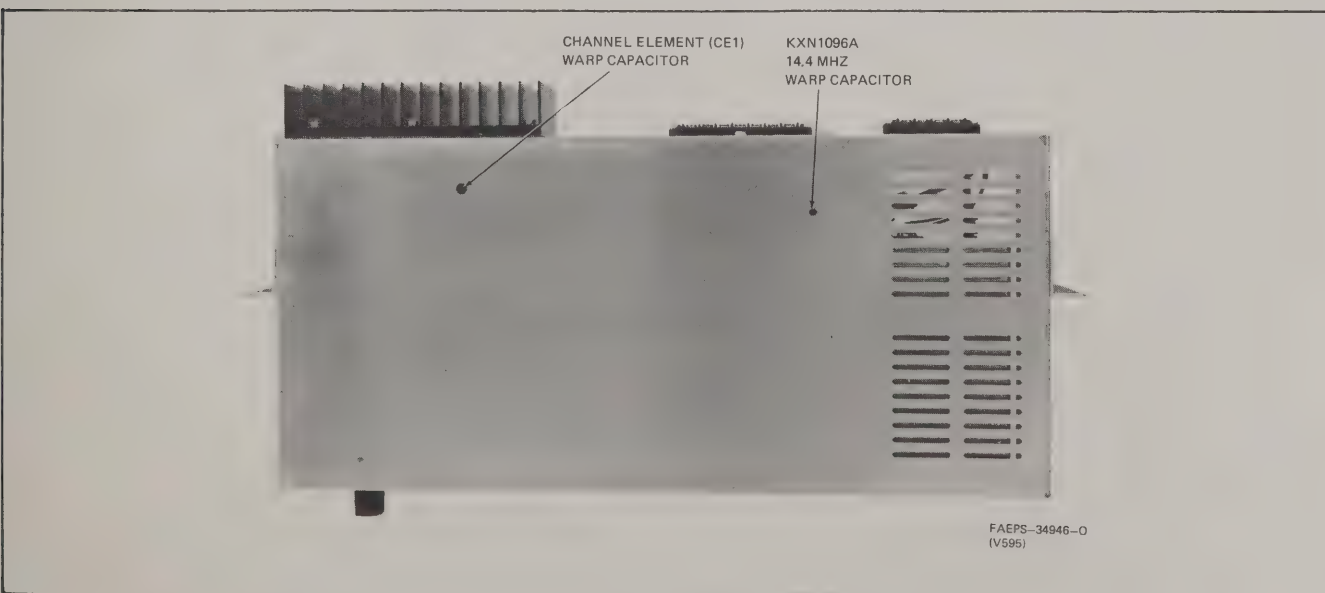


Figure 3. Synthesizer Tuning Adjustment Location

Step 3. Repeat paragraphs 4.3 and 4.4.

4.6 TSI MODULE (+ DEV and - DEV)

Step 1. Set the panel switch on the synthesizer to the OPERATE position.

Step 2. Set the switch on the TSI module to the TEST position.

Step 3. Pulse Insertion — Select the + deviation position of the switch on the TSI module. Set R176 (+ DEV) on the synthesizer panel for the transmitter output frequency of $F_T + 4.000$ kHz.

Step 4. Pulse Blanking — Select the - deviation position of the switch on the TSI module. Set R177 (- DEV) on the synthesizer panel for transmitter output frequency of $F_T - 4.000$ kHz.

Step 5. Return the TEST switch on the TSI module to the normal position.

4.7 INSTANTANEOUS DEVIATION ADJUST (R174)

Step 1. Set the panel switch on the synthesizer to the INSTANTANEOUS DEVIATION ADJUST mode. The adjust mode and data enable lamps should light. The transmitter is now modulated with simulated data.

Step 2. Set R174 on the synthesizer panel for ± 4.0 kHz deviation.

4.8 OFFSET (R175)

Step 1. Disconnect the out-of-lock (transmitter inhibit) line to the station.

Step 2. Set the panel switch on the synthesizer to the OFFSET ADJUST position. The adjust mode lamp should be lit, and the data enable lamp should be pulsating slowly.

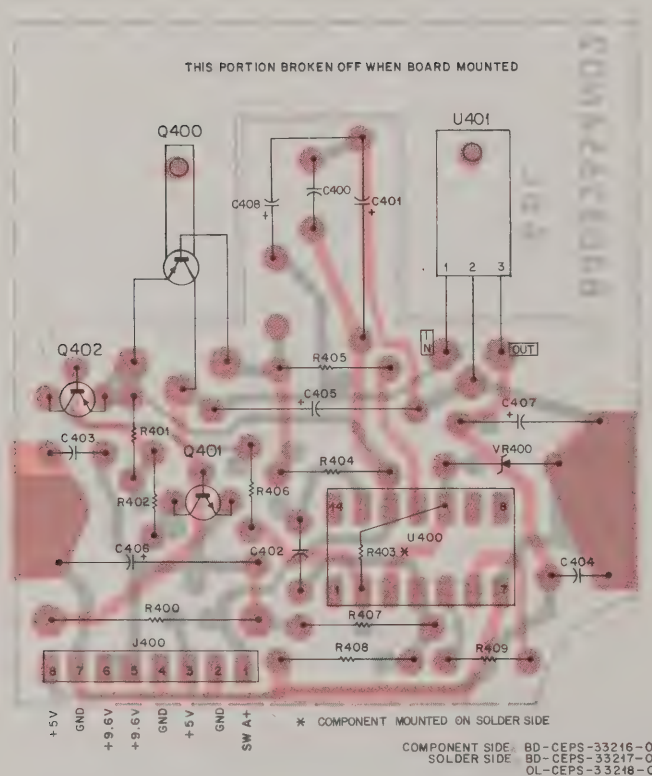
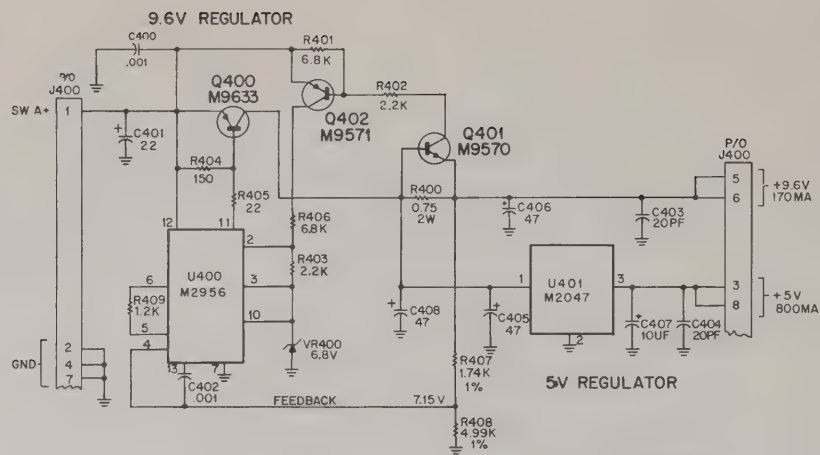
Step 3. Set R175 on the synthesizer for minimum transient or bounce on the transitions from no modulation to data modulation or vice-versa.

Step 4. Re-connect the out-of-lock line to the station. The station should remain keyed. The out-of-lock lamp should not be lit.

Step 5. Return the panel switch to the OPERATE position. The adjust mode lamp should not be lit, and the data enable lamp should be lit if the modem is detecting data.

4.9 HIGH STABILITY OSCILLATOR

Readjust the HSO if necessary and place the station back in service.



SHOWN FROM COMPONENT SIDE

parts list

TRN5058A Voltage Regulator Board

PL-7660-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed: $\mu\text{F} \pm 10\%$; unless otherwise stated		
C400	21-83596E13	.001; 500 V
C401	23-84762H16	22; 20 V
C402	21-83596E13	.001; 500 V
C403, 404	21-11014H32	20 pF $\pm 5\%$; 100 V
C405, 406	23-83214C31	47 $\pm 20\%$; 15 V
C407	23-84762H03	10; 20 V
C408	23-83214C31	47 $\pm 20\%$; 15 V
connector, plug: male; 8-contact		
J400	28-83323N02	
transistor: (see note)		
Q400	48-869633	PNP; type M9633
Q401	48-869570	NPN; type M9570
Q402	48-869571	PNP; type M9571
resistor, fixed: ohms $\pm 5\%$; 1/4 W; unless otherwise stated		
R400	17-82036G13	0.75; 2 W
R401	6-185A69	6.8k; 1/8 W
R402, 403	6-185A57	2.2k; 1/8 W
R404	6-11009A29	150
R405	6-11009A09	22
R406	6-185A69	6.8k; 1/8 W
R407	6-10621C18	1740 $\pm 1\%$
R408	6-10621C62	4990 $\pm 1\%$
R409	6-185A51	1.2k; 1/8 W
integrated circuit: (see note)		
U400	51-83629M56	regulator; 9.6 V
U401	51-84320A47	regulator; 5 V
voltage regulator: (see note)		
VR400	48-82256C37	Zener; 6.8 V; 1 W

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN5058A Voltage Regulator Board
Schematic Diagram, Circuit Board Detail,
and Parts List
Motorola No. PEPS-34965-O
7/14/82 - V&G

PL-8110-O

DESCRIPTION

fixed:
50-10%; 35 V
-20%; 25 V
; 200 V
50-10%; 35 V
%; 100 V

(note)

tifier; 200 V

(see note)

M9642

M9428

ed: $\pm 5\%$; 1/4 W:
erwise stated

W

ulator: (see note)

6.8 V

ts

achine; 6-32 x 5/16"; 2 used
; 2 used

PL-8111-O

DESCRIPTION

ixed:
00 — 10%; 100 V

5 V; slow blow type

(see note)

M9627

slide

;

WHT, BLK-GRN; res. 29 ohms
/EL, BLK-RED; res. 32 ohms
BRN-YEL with BLK center top;

ard:

plug:

tact

ts

11/32 x 1/8"; 4 used
achine: 6-32 x 5/8"; 2 used
ping: 4-40 x 5/16"; 4 used
ping: 4-40 x 1/4"; 4 used
ping: 6-32 x 5/16"; 4 used
ping: 6-32 x 3/8"; 6 used
houlder; 2 used
fuseholder
heat sink mounting; 2 used
LE, fused
ansistor; 2 used
LE, female; 3 contact
R, transistor

socket; 3 used

;

plug; 3 used

10 used

6 used

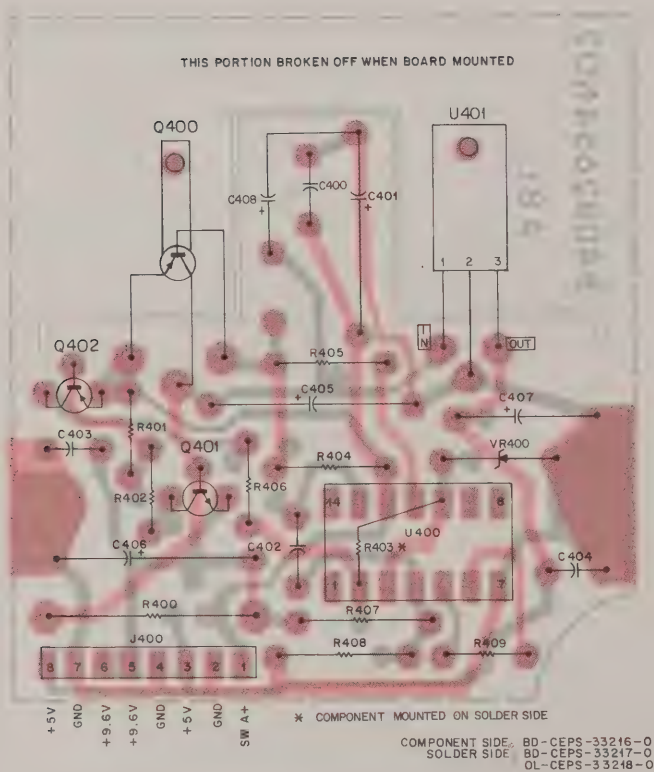
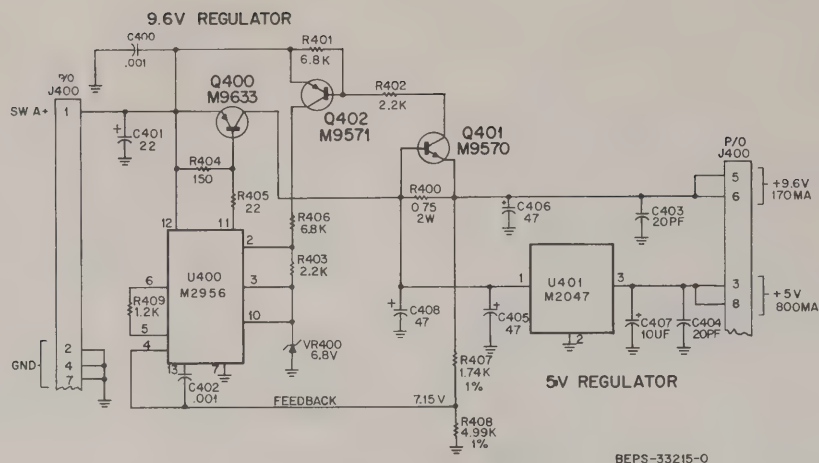
ARNING

PLUG AC

terminal; 4 used

tors, and integrated circuits must

TRN5470A Power Supply Schematic Diagram,
Circuit Board Detail, and Parts List
Motorola No. PEPS-34988-O
7/14/82 - V&G



SHOWN FROM COMPONENT SIDE

parts list

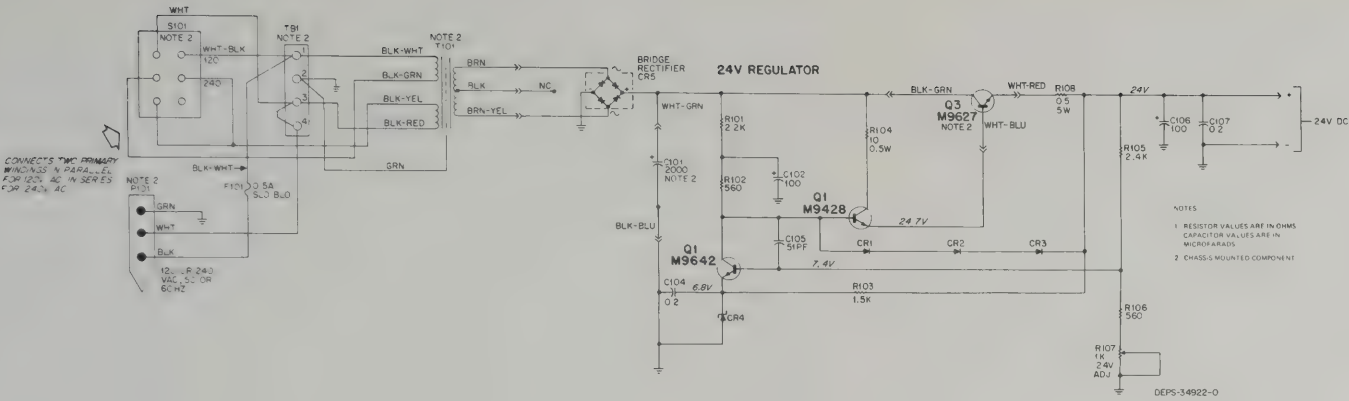
TRN5058A Voltage Regulator Board

PL-7660-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: $\mu\text{F} \pm 10\%$; unless otherwise stated
C400	21-83596E13	.001; 500 V
C401	23-84762H16	22; 20 V
C402	21-83596E13	.001; 500 V
C403, 404	21-11014H32	20 pF $\pm 5\%$; 100 V
C405, 406	23-83214C31	47 $\pm 20\%$; 15 V
C407	23-84762H03	10; 20 V
C408	23-83214C31	47 $\pm 20\%$; 15 V
		connector, plug:
J400	28-83323N02	male; 8-contact
		transistor: (see note)
Q400	48-869633	PNP; type M9633
Q401	48-869570	NPN; type M9570
Q402	48-869571	PNP; type M9571
		resistor, fixed: ohms $\pm 5\%$; 1/4 W; unless otherwise stated
R400	17-82036G13	0.75; 2 W
R401	6-185A69	6.8k; 1/8 W
R402, 403	6-185A57	2.2k; 1/8 W
R404	6-11009A29	150
R405	6-11009A09	22
R406	6-185A69	6.8k; 1/8 W
R407	6-10621C18	1740 $\pm 1\%$
R408	6-10621C62	4990 $\pm 1\%$
R409	6-185A51	1.2k; 1/8 W
		integrated circuit: (see note)
U400	51-83629M56	regulator; 9.6 V
U401	51-84320A47	regulator; 5 V
		voltage regulator: (see note)
VR400	48-82256C37	Zener; 6.8 V; 1 W

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN5058A Voltage Regulator Board
Schematic Diagram, Circuit Board Detail,
and Parts List
Motorola No. PEPS-34965-O
7/14/82 - V&G



parts list

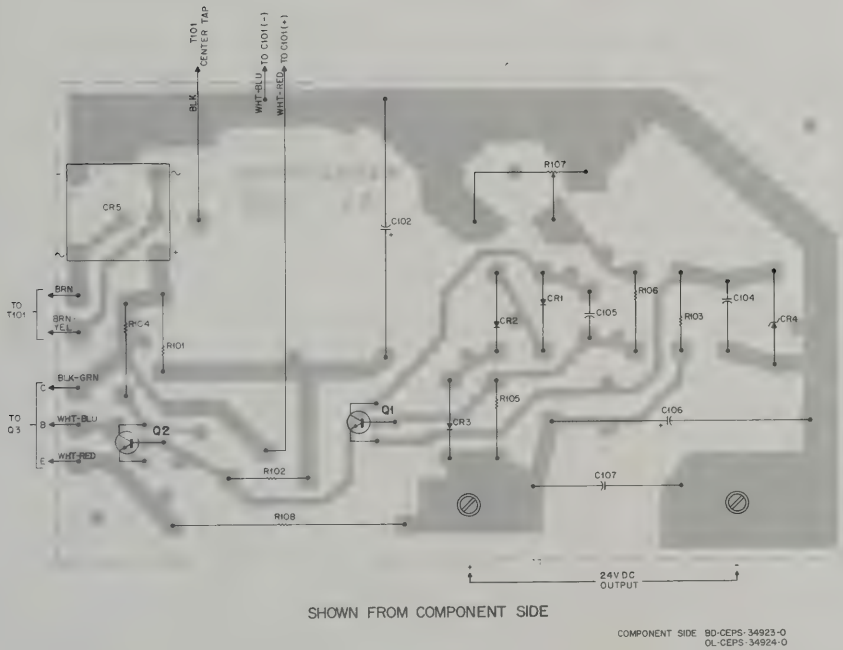
TRN5470A Power Supply Board PL-8110-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C102	23-82077C01	capacitor, fixed: 100 uF + 150-10%; 35 V
C104	21-82372C05	0.2 uF + 80-20%; 25 V
C105	21-84493B27	51 pF ± 5%; 200 V
C106	23-82077C01	100 uF + 150-10%; 35 V
C110	8-82317B01	0.1 uF ± 10%; 100 V
CR1, 2, 3	48-83654H01	diode: (see note)
CR5	48-84621E05	silicon bridge, rectifier; 200 V
Q1	48-869642	transistor: (see note)
Q2	48-869428	NPN; type M9642
		NPN; type M9428
R101	6-11009A57	resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R102	6-11009A43	2.2k
R103	6-11009A53	560
R104	6-125C01	1.5k
R105	6-11009A58	10; 1/2 W
R106	6-11009A43	2.4k
R107	6-11009A43	560
R108	18-83168C03	variable; 1k
	17-82586H08	W.W. 0.5; 5 W
VR1	48-82256C02	voltage regulator: (see note)
		Zener type: 6.8 V
mechanical parts		
3-84482M01		SCREW, machine; 6-32 x 5/16"; 2 used
29-83362G01		TERMINAL; 2 used

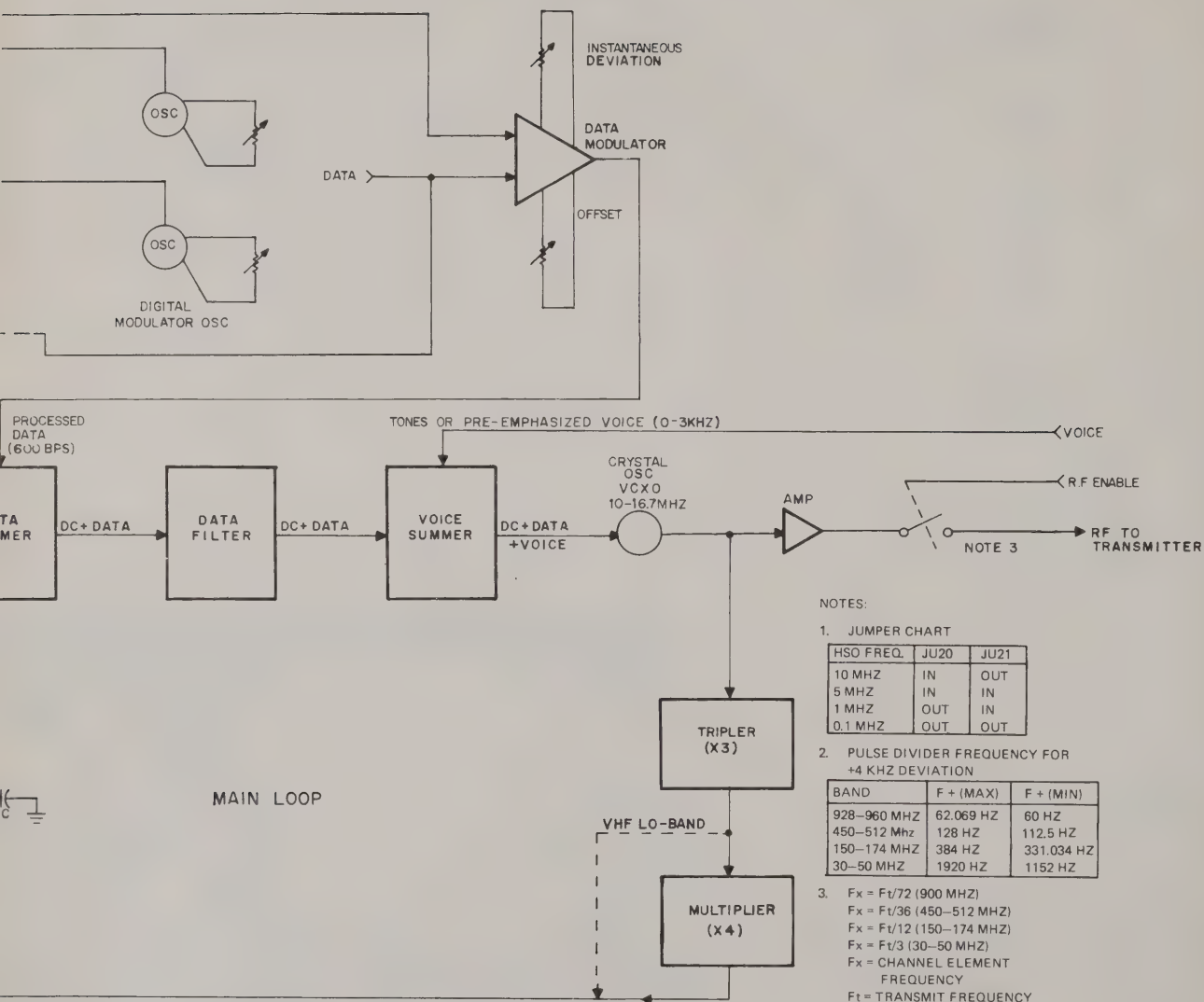
TRN5469A Power Supply Chassis and Hardware PL-8111-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C101	23-83093G21	capacitor, fixed: 2000 uF + 100 - 10%; 100 V
F101	65-475395	fuse: 1/2 amp; 125 V; slow blow type
Q3	48-869627	transistor: (see note)
		NPN; type M9627
S101	40-84241G03	switch: 2 position; slide
T101	25-83043L01	transformer: pri: #1 BLK-WHT, BLK-GRN; res. 29 ohms pri: #2 BLK-YEL, BLK-RED; res. 32 ohms sec: BRN, BRN-YEL with BLK center top; res. 1 ohm
TB1	31-120965	terminal board: 4 contact
P101	28-83176L01	connector, plug: male; 3-contact
mechanical parts		
2-119913		NUT, 8-32 x 11/32 x 1/8"; 4 used
3-122922		SCREW, machine; 6-32 x 5/8"; 2 used
3-134212		SCREW, tapping; 4-40 x 5/16"; 4 used
3-134169		SCREW, tapping; 4-40 x 1/4"; 4 used
3-135575		SCREW, tapping; 6-32 x 5/16"; 4 used
3-136934		SCREW, tapping; 6-32 x 3/8"; 6 used
4-844093		WASHER, shoulder; 2 used
7-83181L01		BRACKET, fuseholder
7-84139N01		BRACKET, heat sink mounting; 2 used
9-82083C03		RECEPTACLE, fused
9-82673A01		SOCKET, transistor; 2 used
9-83175L01		RECEPTACLE, female; 3 contact
14-865854		INSULATOR, transistor
26-84212E02		HEAT SINK
29-84151L01		TERMINAL, socket; 3 used
29-8417854		LUG, tongue
29-84150L01		TERMINAL, plug; 3 used
42-10217A02		STRAP, tie; 10 used
42-83123F01		RETAINER; 6 used
54-84789L01		LABEL, WARNING
30-83211C04		CABLE AND PLUG AC
37-107998		SLEEVING
29-812979		LUG, crimp/terminal; 4 used

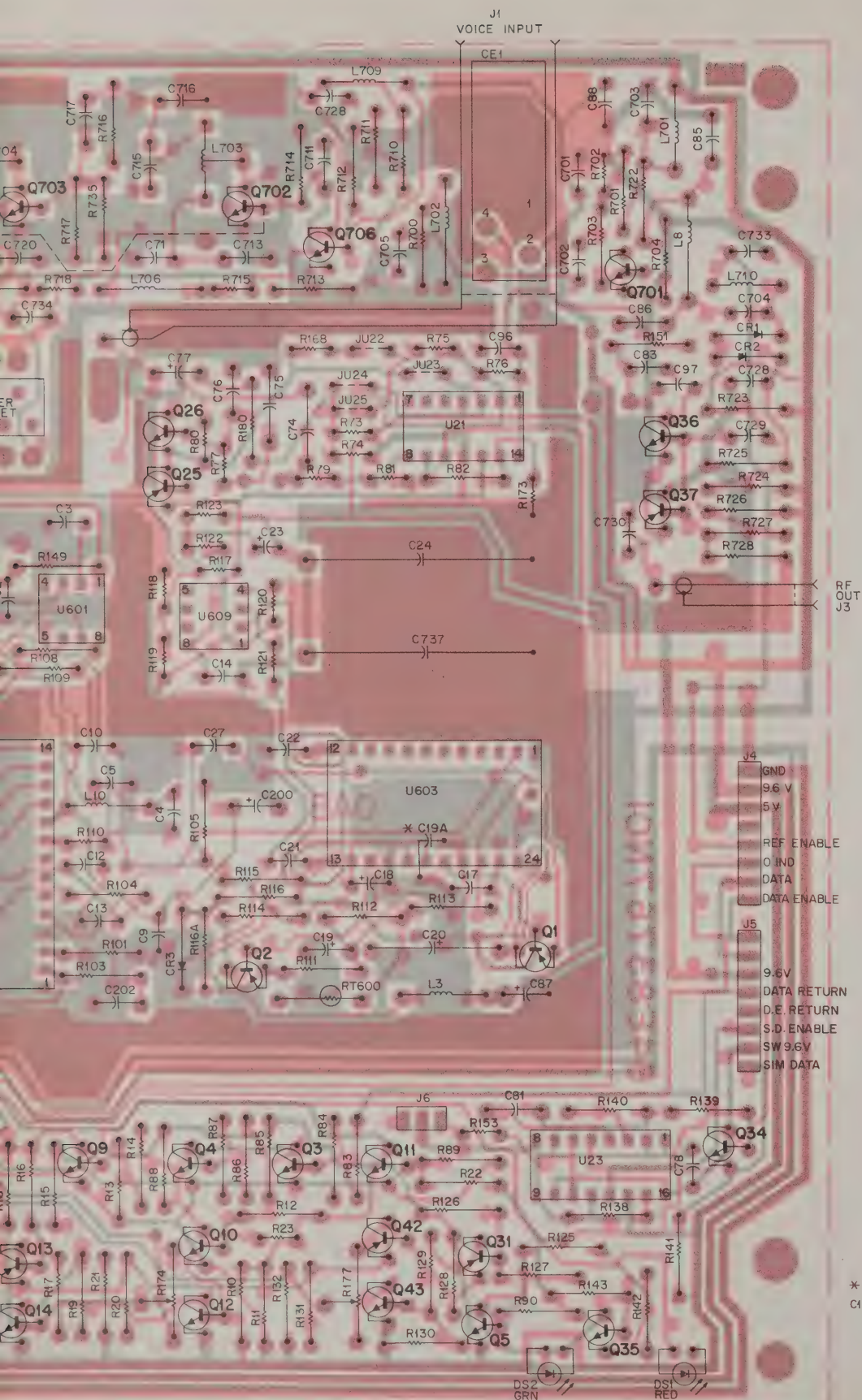
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



TRN5470A Power Supply Schematic Diagram, Circuit Board Detail, and Parts List
Motorola No. PEPS-34988-O
7/14/82 - V&G



Paging Synthesizer Intercabling Diagram
Motorola No. **GDEPS-34949-A**
10/5/82 - V & G



COMPONENT SIDE BD-EEPS-34918-A
 SOLDER SIDE BD-EEPS-34919-A
 OL-EEPS-34920-0

*
 C19A LOCATED ON SOLDER SIDE

ES

Unless otherwise indicated, resistor values are in ohms, capacitor values are in microfarads, and inductor values are in millihenries.

Integrated circuits on this board are TTL & CMOS devices.

Types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Mfg.'s Description
5, 6, 7, 8	71K76	14	7	Dual Timer
	84L38	16	8	Presetable - N Counter
	61L04	14	7	Quad 2 Input NAND Gate
	61L15	14	7	Dual D Flip-Flop
	27M11	14	7	Quad 2 Input NAND Gate
	48M23	14	7	Quad 2 Input Exclusive OR Gate
	61L15	14	7	Dual D Flip-Flop
15	61L10	5		Decade Counter
	71K37	16	8	Dual 4 Input Multiplexer
	09M79	14	7	Quad 2 Exclusive OR Gate
	91B02	—	—	14.4 Osc.
20	61L85	5, 6, 7, 10		One - 12 Counter
	29M81	4	11	Quad Op Amp
	29M32	8	4	Dual Op Amp
	84L62	16	8	Programmable Timer
	68F68	—	4	3 - 4 Prescaler
	68F63	10	4	Prog. Divider
	68F59	18	16	Sample & Hold Phase Det.
	89L03	16	8	ROM
	71K74	3	12	Quad Comparator
	71K94	14	7	Quad 2 Input OR Gate
	29M32	14	7	Dual Op Amp

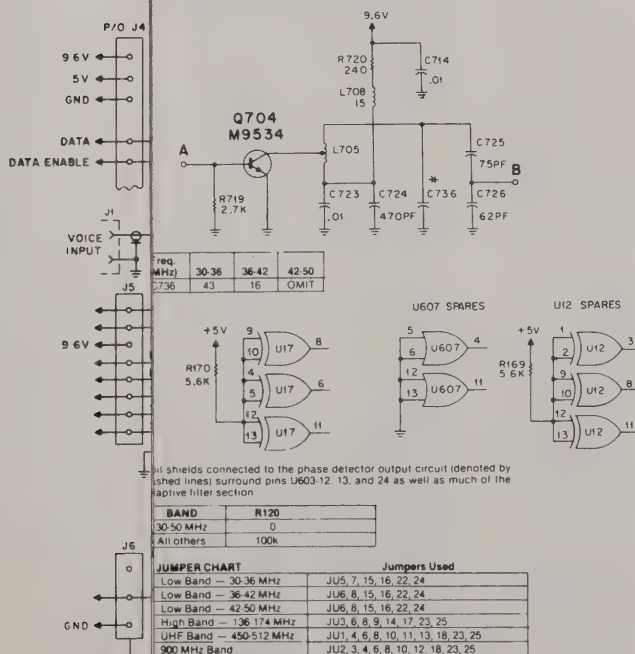
JU21	JU20	External Reference
IN	IN	5 MHz
OUT	IN	10 MHz
IN	OUT	1 MHz
OUT	OUT	100 kHz

Set the meter selection switch to position D for multiplier tuning.

Band	C80
30-50 MHz	001
All Others	47 pF

Band (MHz)	C42	C43	R25	R26
30-36	4000	4000	9090	9090
36-42	3900	3900	8660	8660
42-50	4700	4700	8450	8450
VHF	3900	3400	9090	9090
UHF				
900				

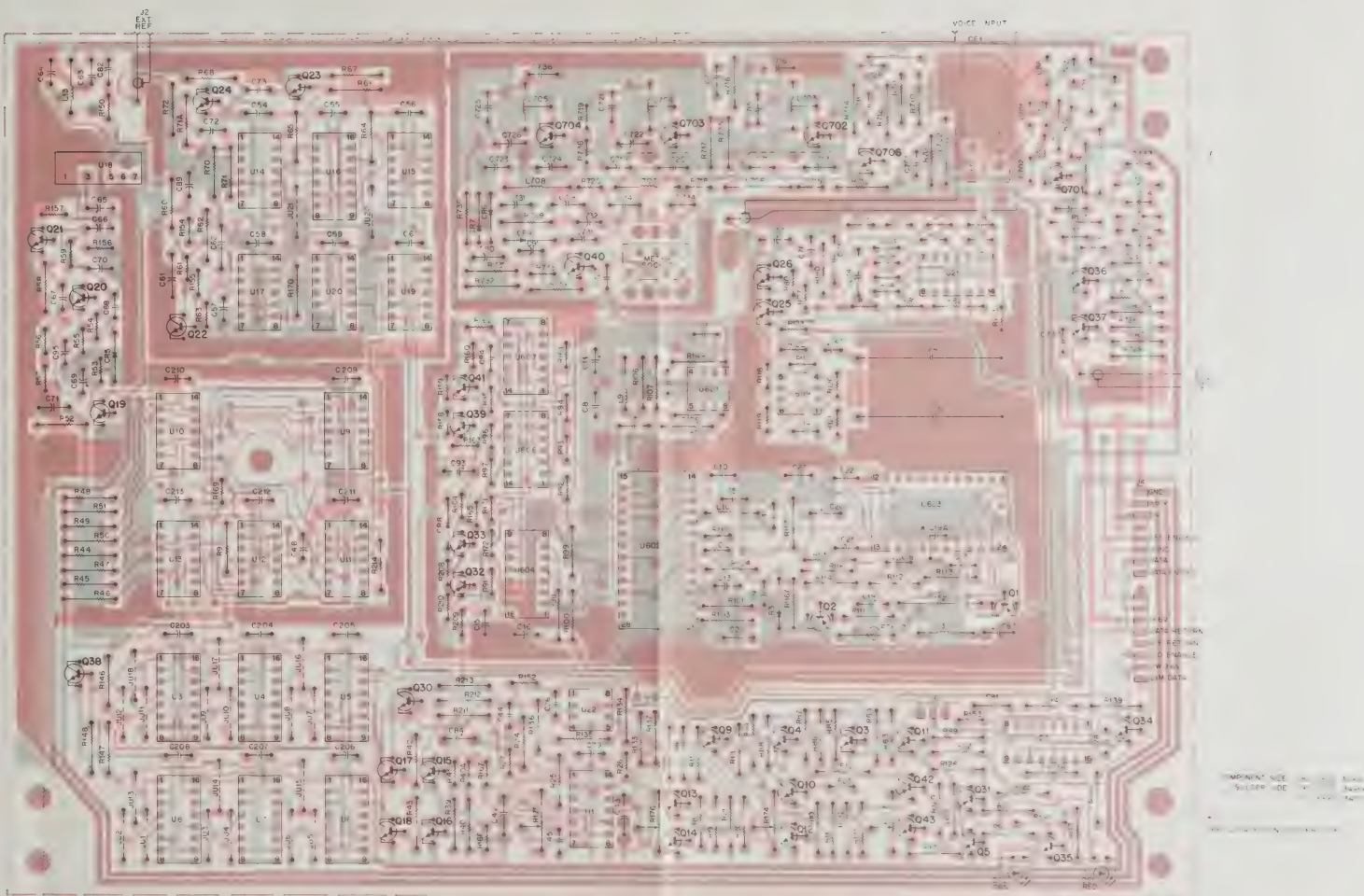
U19A is mounted on solder side of board.
Dashed line is a wire jumper in place for low band operation.
For Low Band, connect this circuit between points "A" & "B".



Paging Synthesizer Schematic Diagram,
Circuit Board Detail, and Parts List
Motorola No. PEPS-34989-O
(Sheet 2 of 2)
7/14/82 - V&G

parts list

PEPS446A Synthesizer Interconnect Cable				PL1017-0				PEPS446A Synthesizer Interconnect Cable				PL1017-0			
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL
		DESCRIPTION			DESCRIPTION			DESCRIPTION			DESCRIPTION			DESCRIPTION	
DS3	48-88245C04	light emitting diode (see note)	C2	21-11014432	capacitor, fixed: 50 pF ± 5%; 100 V	L3	24-82723H07	choke: 10 uH	R81	61-1009575	2.4k	R731	61-1009477	15k	
		RED LED	C3	21-11015407	0.1 ± 80.20%, 20 V	L8	24-82723H07	choke: 10 uH	R82	61-1009575	2.2k	R732	61-1009483	1.5k	
		connector, plug:	C4	21-11014432	20 pF ± 5%; 50 V	L10	24-82723H07	choke: 10 uH	R86	61-1009575	1.1k	R733	61-1009487	82k	
P2	28-33090901	consists of	C5	21-11015805	220 pF	L701	24-82723H07	choke: 10 uH	R87	61-1009566	5.1k	R734	61-1009489	22k	
P4	15-3142M07	housing, 8-position	C6	21-11015844	1000 pF	L702	24-82723H07	choke: 0.02 uH	R88	61-1009566	5.1k			thermistor:	
		consists of	C8	21-11014432	20 pF ± 5%; 50 V	L705	24-84972A15	variable: 4.0 to 102 kHz (PREC, 30.50 MHz)	R101	61-1009467	5.6k			1k @ 25°C	
		housing, 8-position	C9	21-11015805	220 pF	L708	24-82545009	choke: 15 uH (30-50 MHz)	R103	61-1009467	5.6k				
P6	28-82717W01	contact, receptacle, 7 used	C10	21-11017817	0.150 V	L709	24-82723H07	choke: 10 uH	R104	61-1009467	5.6k				
		consists of	C11	23-11013F10	0.56 ± 5%, 20 V	L710	24-82723H03	choke: 23 uH	R106	61-1009461	4.7k				
		housing, 8-position	C12	21-11015805	220 pF				R107	61-1009467	5.6k				
P8	15-34301A19	housing, 4-position	C13	21-11017817	0.150 V			transistor: (see note)	R108	61-1009467	5.6k				
	34-6217W01	contact, receptacle, 8 used	C14	21-11015407	0.1 ± 80.20%				R109	61-1009461	4.7k				
	28-82717W01	contact, receptacle, 8 used	C15	21-11015805	220 pF ± 5%				R110	61-1009467	5.6k				
		plug, 2044300001	C16	21-11015407	0.1 ± 80.20%				R111	61-1009467	5.6k				
P7	15-34301A19	housing, 4-position	C18	21-11015407	0.1 ± 80.20%				R112	61-1009467	5.6k				
	34-6217W01	contact, receptacle, 2 used	C19	21-11017807	0.068 ± 5%, 20 V				R113	61-1009467	5.6k				
	28-82717W01	contact, receptacle, 2 used	C20	23-11013F10	0.7 ± 20%, 20 V				R114	61-1009467	5.6k				
P400	28-33090901	consists of	C21	28-84330G06	47 ± 20%, 20 V				R115	61-1009467	5.6k				
		housing, 8-position	C22	21-11015801	100 pF				R116	61-1009467	5.6k				
	28-82717W01	contact, receptacle, 5 used	C23	21-11017801	0.001 ± 50 V				R117	61-1009467	5.6k				
			C24	23-84330G14	1.35 V				R118	61-1009467	5.6k				
		switch, rotary: 3-position	C25	840026802	5.50 V				R120	61-1009467	5.6k				
			C26	21-11015407	0.1 ± 80.20%				R121	61-1009467	5.6k				
		terminal board: 7-terminal	C27	21-11015407	0.1 ± 80.20%				R122	61-1009467	5.6k				
		7-wire terminal	C36	21-11015801	100 pF				R123	61-1009467	5.6k				
		non-referenced items	C37	840026802	5.50 V				R125	61-1009467	5.6k				
			C42	21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R126	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R127	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R128	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R129	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R130	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R131	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R132	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R133	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R134	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R135	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R136	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R137	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R138	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R139	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R140	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R141	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R142	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R143	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R144	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R145	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R146	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R147	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R148	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R149	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R150	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R151	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R152	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R153	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R154	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R155	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R156	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R157	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R158	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R159	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R160	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R161	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R162	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R163	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R164	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R165	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R166	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R167	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R168	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R169	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R170	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R171	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R172	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R173	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R174	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R175	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R176	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R177	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R178	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R179	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R180	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)				R181	61-1009467	5.6k				
				21-1101580	4000 pF ± 1%, 500 V (30-36 MHz)										



SHOWN FROM COMPONENT SIDE



MOTOROLA INC.

Communications
Sector

JUMPER AND CABLE CONNECTIONS

FOR TDN6869A/70A MODEMS

1. GENERAL

Before either of these modems can be used, certain jumpers within the modem must be placed in the proper position to ensure correct operation with the paging station.

2. JUMPER POSITIONING

Remove the housing from the modem and position the jumpers as follows:

Jumper	Position
Carrier Detect Level	- 30 dBm Level
Carrier Detect Delay	6 msec, Option
4-Wire/2-Wire Operation	4-Wire Only

Reinstall the modem housing.

3. CABLE CONNECTIONS

Refer to schematic diagram PEPS-35122 for information on how to connect the two cables supplied.

4. MODEM OPERATION

The front panel rotary switch must be in the DATA position, and the rear panel power switch placed in the ON position for proper operation of the modem. Refer to the separately supplied modem instruction manual for further information.

parts list

TL9333A Synthesizer Board, 150-174 MHz

PL 8091 O

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
C2	21-11014H32	capacitor, fixed: uF ± 10%; 100 V: unless otherwise stated
C3	21-11015A07	20 pF ± 5%, 50 V
C4	21-11014H32	01 ± 80-20%, 100 V
C5	21-11015B05	220 pF ± 5%, 50 V
C6	21-82187844	1000 pF
C8	21-11014H32	20 pF ± 5%, 50 V
C9	21-11015B05	220 pF
C10	8-11017B17	01 ± 50 V
C11	23-11013F10	0.56, 35 V
C12	21-11015B05	220 pF
C13	8-11017B17	01 ± 50 V
C14	21-11015A07	01 ± 80-20%
C15	21-11015B05	220 pF ± 5%
C16	21-11015A07	01 ± 80-20%
C17	8-1017B07	0068 50 V
C18	23-11013D55	47 ± 20%, 20 V
C19	23-8453G006	47 ± 20%, 20 V
C19A	21-11015B01	100 pF
C20	8-80027B08	0039 ± 5%
C21	8-1017B06	0047, 50 V
C22	8-1017B07	001, 50 V
C23	23-8453G014	1, 35 V
C24	8-80026B02	5, 50 V
C25	21-11015A07	01 ± 80-20%
C26	21-11015A07	01 ± 80-20%
C27	21-11015B01	100 pF
C28	8-80026B02	5, 50 V
C42, 43	21-82537B49	3900 pF ± 1%
C44, 45	21-11015A07	01 ± 80-20%
C46	62 pF	11014A44
C48	21-11015A07	01 ± 80-20%
C49	23-11013D55	47 ± 20%, 20 V
C50 thru 73	21-11015A07	01 ± 80-20%
C74	8-83813H23	0068 ± 5%
C75	8-83813H27	0068 ± 5%
C76	21-84426B48	665 pF ± 5%, 500 V
C77	23-8453G029	47 ± 20%, 10 V
C78, 79	21-11015A07	01 ± 80-20%
C80	21-11014H41	47 pF ± 5%
C81	8-82905G03	047 ± 5%, 50 V
C82, 83	21-11015A07	01 ± 80-20%
C84	23-8453G029	47 ± 20%, 10 V
C85, 86	21-84494B29	10 pF ± 5%, 500 V
C87, 88	23-8453G029	47 ± 20%, 10 V
C89	21-11015A07	01 ± 80-20%
C91	21-11015A07	01 ± 80-20%
C93	23-8453G029	47 ± 20%, 10 V
C94, 95	21-11015A07	01 ± 80-20%
C96	8-11017B01	001, 50 V
C97	21-11015A07	01 ± 80-20%
C100	23-8453G026	47 ± 20%, 20 V
C201	21-11015A07	01 ± 80-20%
C202	21-82372D04	05 ± 80-20%, 25 V
C203 thru 213	21-11015A07	01 ± 80-20%
C701 thru 703	21-11015A07	01 ± 80-20%
C704	21-11015B01	100
C705	21-84403B02	22 pF ± 5%, 50 V
C711	21-83406D44	47 pF ± 5%, 50 V
C712	21-11015A07	01 ± 80-20%
C713	21-11015B09	470 pF
C714	21-11015A07	01 ± 80-20%
C715	21-82610C09	120 pF
C716	21-82610C42	62 pF ± 5%, 50 V
C717	21-84493B02	22 ± 5%, 50 V
C718, 719	21-11014H41	47 ± 5%, 50 V
C720	21-83596E13	001, 500 V
C721	21-82610C44	100 pF ± 5%, 50 V
C722	21-82610C03	47 pF ± 5%, 200 V
C723	21-11014H25	10 pF ± 0.5 pF
C724	21-11015B09	470 pF
C725	21-83406D53	16 pF ± 5%, 50 V
C726	21-82610C42	62 pF ± 5%, 50 V
C727	21-83406D90	11 pF ± 5%, 50 V
C728	21-11014H41	47 pF ± 5%
C729, 730	21-11015A07	01 ± 80-20%
C731	21-11015B01	100
C732, 733	21-82355B82	1 pF ± 0.25 pF, 50 V
C734, 735	21-11015A07	01 ± 80-20%
C737	21-11015A05	01 ± 80-20%

diode, (see note)

CR1, 2	48-8351F053	silicon
CR3	48-8332G002	germanium
CR4	48-82178A01	germanium
CR5	48-83654H01	silicon
CR6, 7	48-84516A04	not carrier
CR8	48-83654H01	silicon

light emitting diode: (see note)

D51	48-88245C04	red
D52	48-88245C06	green

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
J1, 2, 3	8-84960D01	connector, receptacle:
J4, 5	28-82822L07	female, single contact
J6	28-82822L01	male, 8 contact
J8	28-82822L01	male, 3 contact
L3	24-82723H07	coil, rf
L8	24-82723H07	choke, 10 uH
L8, 10	24-83961B01	3 turns
L13	24-82723H07	choke, 10 uH
L14	24-82723H07	choke, 10 uH
L702	24-80900A81	choke, 0.62 uH
L703	24-84297A15	tunable: 4-12 turns (REQ)
L704	24-83857G08	tunable: 3-12 turns (VIO)
L705	24-83857G08	variable: 3-12 turns (VIO)
L706	24-82540D09	choke, 15 uH
L707, 708	24-82835G08	choke, 2.6 uH
L709	24-82723H07	choke, 10 uH
L710	24-82723H03	choke, 23 uH
Q1	48-86954B	PNP: type M954B
Q2	48-86954B	PNP: type M964B
Q3, 4, 5	48-86954B	PNP: type M964B
Q8, 10, 11, 12	48-86954B	PNP: type M964B
Q13	48-86954B	PNP: type M964B
Q14 thru 18	48-86954B	PNP: type M964B
Q19, 20, 21	48-869570	PNP: type M8570
Q22	48-86954B	PNP: type M964B
Q23, 24	48-869570	PNP: type M8570
Q25	48-86954B	PNP: type M964B
Q26	48-86954B	PNP: type M964B
Q30	48-86954B	PNP: type M964B
Q31, 32	48-86954B	PNP: type M964B
Q33, 34, 35	48-869570	PNP: type M8570
Q36	48-869570	PNP: type M8570
Q37	48-869570	PNP: type M8570
Q38, 39	48-86954B	PNP: type M964B
Q40	48-869570	PNP: type M8570
Q41, 42	48-86954B	PNP: type M964B
Q43	48-86954B	PNP: type M964B
Q701	48-869570	PNP: type M8570
Q702, 703	48-86954B	PNP: type M964B
Q704	48-86954B	PNP: type M964B
Q705	48-869570	PNP: type M8570
R9	6-11009A25	100
R10	6-11009A49	1k
R11	6-11009A87	100k
R12	6-11009A81	22k
R13, 14	6-11009A67	5.8k
R15	6-11009A55	1.8k
R16	6-11009A61	3.3k
R17	6-11009A57	2.2k
R18	6-11009A87	39k
R19	6-11009A57	2.2k
R20, 21	6-11009A49	1k
R22	6-11009A73	10k
R23	6-11009E81	22k
R24	6-11009A37	33k
R25, 26	6-84376L15	9090 ± 0.5% (136-174 MHz)
R27	6-11009E25	33k
R28	6-11009A73	10k
R29	6-11009A87	47k
R40	6-11009A89	47k
R41	6-11009E89	47k
R42	6-11009E73	10k
R43	6-11009A73	10k
R44 thru 51	6-11009A73	10k
R52	6-11009A38	39k
R53	6-11009E59	2.7k
R54	6-11009A49	1k
R55	6-11009E25	100
R56	6-11009E82	24k
R57	6-11009E81	22k
R58	6-11009A49	1k
R59	6-11009E85	4.7k
R60, 61	6-11009A67	5.8k
R62	6-11009A43	560
R63	6-11009E73	10k
R64, 65	6-11009A73	10k
R66	6-11009A41	470
R67, 68	6-11009A29	15k
R69	6-11009A51	1.2k
R70	6-11009A18	51
R71	6-11009A17	47
R72, 74	6-11009E87	39k
R75	6-11009E87	100k
R76	6-11009E89	120k
R77	6-11009E88	43k
R78	6-11009E84	4.3k
R79	6-11009E39	39k
R80	6-11009E73	10k
R81	6-11009E77	15k
R82	6-11009A77	15k

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
R83, 84	6-11009A87	5.8k
R85	6-11009A57	2.2k
R86	6-11009A87	5.8k
R87	6-11009A89	47k
R88	6-11009A87	5.8k
R89	6-11009A89	47k
R90	6-11009A73	10k
R91, 92	6-11009E58	2.4k
R92	6-11009E85	4.7k
R95	6-11009E57	2.2k
R96	6-11009E75	12k
R97	6-11009E86	5.1k
R98, 99, 100	6-11009A87	5.8k
R101	6-11009A49	1k
R103	6-11009A35	27k
R104	6-11009A49	1k
R105	6-11009A85	47k
R106	6-11009A41	47k
R107, 108	6-11009A87	5.8k
R109	6-11009A85	47k
R110	6-11009A45	660
R111	6-11009A29	150
R112	6-11009A38	39k
R113	6-11009A33	22k
R114	6-11009A01	1k
R115	6-11009A56	2k
R116	6-11009A59	2.7k
R116A	6-11009A87	5.8k
R117, 118	6-11009E49	1k
R119	6-11009E73	10k
R120	6-11009E23	82k
R121	6-11009E49	1k
R122	6-11009F10	330k
R123	6-11009E87	39k
R125, 126	6-11009A89	47k
R127	6-11009A73	10k
R128	6-11009A89	47k
R129	6-11009A73	10k
R130	6-11009A89	47k
R131, 132	6-11009A73	10k
R133	6-11009B14	3k
R134 thru 136	6-11009A77	15k
R137	6-11009A84	47k
R138	6-11009A77	15k
R139	6-11009A91	56k
R140	6-11009A99	100k
R141	6-11009A87	5.8k
R142	6-11009A44	62k
R143	6-11009A87	39k
R146	6-11009A65	4.7k
R147	6-11009A59	2.7k
R148	6-11009A89	47k
R149	6-11009A19	56k
R150	6-11009E73	10k
R151	6-11009A73	10k
R152	6-11009E81	10k
R153	6-11009E49	1k
R154	6-11009E23	82k
R155	6-11009E71	8.2k
R156	6-11009E87	5.8k
R157	6-11009E18	51k
R158	6-11009E73	10k
R159	6-11009E01	1k
R160	6-11009E65	4.7k
R161	6-11009E58	2.4k
R162	6-11009E59	2.7k
R163	6-11009E33	22k
R164, 165	6-11009E73	10k
R166, 167	6-11009E71	8.2k
R168	6-11009A38	39k
R169, 170	6-11009E87	5.8k
R171	6-11009E75	12k
R172	6-11009E72	8.1k
R173	6-11009E65	4.7k
R174	18-84143N08	variable: 50k
R175, 176, 177	18-84143N01	variable: 10k
R180	6-11009E97	10k
R208	6-11009E81	22k
R209	6-11009E51	1.2k
R210	6-11009E89	47k
R211	6-11009A73	10k
R212	6-11009A89	47k
R213	6-11009A65	4.7k
R214	6-11009A73	10k
R215	6-11009A57	2.2k
R216	6-11009A86	82k
R217	6-11009E75	12k
R218	6-11009A18	51k
R219	6-11009A29	150
R220	6-11009A85	47k
R221	6-11009A18	51k
R222	6-11009A29	150
R223	6-11009A59	2.7k
R224	6-11009A49	1k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R177	6-11009A59	2.7k
R178	6-11009E34	240
R179	6-11009E49	1k
R180	6-11009E34	240
R181	6-11009A49	1k
R182	6-11009A57	2.2k
R183	6-11009A49	1k
R184	6-11009A49	1k
R185	6-11009A49	1k
R186	6-11009A49	1k
R187	6-11009A49	1k
R188	6-11009A49	1k
R189	6-11009A49	1k
R190	6-11009A49	1k
R191	6-11009A49	1k
R192	6-11009A49	1k
R193	6-11009A49	1k
R194	6-11009A49	1k
R195	6-11009A49	1k
R196	6-11009A49	1k
R197	6-11009A49	1k
R198	6-11009A49	1k
R199	6-11009A49	1k
R200	6-11009A49	1k
		thermistor: 1k @ 25°C
		Integrated circuitry (see note)
U1	51-84371X78	dual timer
U2 thru 8	51-82884L38	presettable - N counter
U9	51-84561L04	quad 2-input NAND gate
U10	51-84561L15	dual "D" flip-flop
U11	51-83267M11	quad 2-input NAND gate
U12	51-82848M23	quad 2-input exclusive OR gate
U13	51-84561L15	dual "D" flip-flop
U14, 15	51-84561L10	decade counter
U16	51-84371X37	dual 4-line to 1-line multiplexer
U17	51-82609M79	quad 2 exclusive OR gate
U18	51-80291B02	14.4 oscillator
U19, 20	51-84561L85	1 - 12 counter
U21	51-83629M81	quad op amplifier
U22	51-83629M52	dual op amplifier
U23	51-82884L82	programmable timer
U601	51-84768F56	precaler
U602	51-84768F63	programmable divider
U603	51-84768F59	sample and hold phase detector
U604	TRN54B1A	ROM (Specify Customer Frequency)
U605	51-84371X74	quad comparator
U607	51-84371X34	quad 2 input OR gate
U609	51-83629M32	dual op amplifier
		non-referenced items
3-134312	SCREW, TORQUE, 4-40 x 5/16", 6 used	
9-84924E01	IC SOCKET, 16 pin	
9-84207B01	METERING PLUG, 7 pin	
26-84032N01	SHIELD, multi solder side multiplexer	
26-84031N01	SHIELD, wall binary modulator	
26-84032N01	SHIELD, component side loop filter	
26-84056N01	SHIELD, multi solder side multiplexer	
26-84056N01	SHIELD, driver solder side divider	
26-84061N01	SHIELD, component side rel. amplifier	
26-84062N01	SHIELD, component side rel. loop	
26-84063N01	SHIELD, component side binary modulator	
26-84072N01	SHIELD, component side phase detector	
26-84063N01	SHIELD, solder side empl.	
26-84049N01	SHIELD, solder side loop filter	
26-84059N01	SHIELD, solder side rel. loop	
26-8424B002	SHIELD, solder side 1 loop	
42-8424B001	RETAINDER: can, 3 used	
29-80114A01	CLIP, coaxial: 3 used	
30-83794C01	CABLE, coaxial: WHT	
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.		



1. GENERAL

Before either of these modems can be used, certain jumpers within the modem must be placed in the proper position to ensure correct operation with the paging station.

2. JUMPER POSITIONING

Remove the housing from the modem and position the jumpers as follows:

Jumper	Position
Carrier Detect Level	- 30 dBm Level
Carrier Detect Delay	6 msec. Option
4-Wire/2-Wire Operation	4-Wire Only

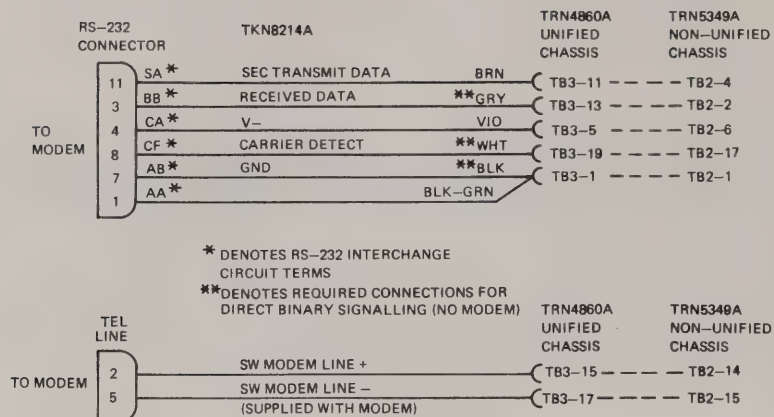
Reinstall the modem housing.

3. CABLE CONNECTIONS

Refer to schematic diagram PEPS-35122 for information on how to connect the two cables supplied.

4. MODEM OPERATION

The front panel rotary switch must be in the DATA position, and the rear panel power switch placed in the ON position for proper operation of the modem. Refer to the separately supplied modem instruction manual for further information.



BEPS-34993-A

parts list

TKN8214A Modem Cable

PL-8135-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	28-84506E01	connector, plug; male; 25-contact
		mechanical parts
	14-84502E01	HOOD, contact
	29-812979	LUG, crimp terminal; 4 used
	29-84078B01	LUG, flanged spade
	42-10217A02	STRAP, tie; 10 used



MOTOROLA INC.

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WATTMETER OPTIONS

C47AD; 0-150 WATTS/25-1000 MHz

C47AE; 0-400 WATTS/25-525 MHz

1. FUNCTIONAL DESCRIPTION

The C47AD/AE Wattmeter Options provide built-in metering of the transmitter forward and reverse power levels.

2. OPERATING INSTRUCTIONS

Select the desired power level and direction. Read the sampled power level from the meter. High power readings are 0-150 watts or 0-400 watts; Low power readings are 0-25 watts or 0-50 watts respectively. The meter functions are listed in the table shown in Figure 1.

NOTE

The meter should be in the OFF position when it is not in use. Do not select low power settings when measuring power levels greater than 25 watts. The power meter may falsely indicate high reflected power due to directivity in the wattmeter element.

3. RF POWER METER ADJUSTMENT

Step 1. Key the station into a wattmeter and a 50-ohm load with rated station output power.

Step 2. Set meter to FWD-HIGH position.

Step 3. Adjust R1 until it agrees with the wattmeter reading.

Step 4. Reverse the cable connections on the directional coupler.

Step 5. Reduce the power on the station to low power for a full scale reading.

Step 6. Put the meter switch in the REV-LOW position.

Step 7. Adjust R7 on the power meter until it agrees with the wattmeter reading.

Step 8. Dekey the station and return all PA cables and the antenna.

4. DIRECTIONAL COUPLER KIT

4.1 FUNCTIONAL OPERATION

The directional coupler kit (wattmeter element) samples both forward and reflected power outputs of the final power amplifier. Two dc voltages are applied to the rf power meter and main interconnect board. The rf power meter uses these dc voltages to indicate forward and reflected rf power for the station. The dc voltages at the main interconnect board are routed to the optional alarm logic module. This module uses these voltages to indicate station status for possible alarm conditions.

4.2 MAINTENANCE AND TROUBLESHOOTING

The wattmeter element cannot be repaired since it contains hybrid circuitry. Consequently, the entire unit should be replaced if a fault is indicated by the following test procedure (refer to Figure 2).

Step 1. Disconnect the antenna cable and connect a wattmeter and 50-ohm load to the antenna connector.

Step 2. Key the station. RF power from final power amplifier passes through the wattmeter element to a wattmeter and a 50-ohm load. Verify the FWD-to-REF voltage (forward power) and the REV-to-REF voltage (reverse power) conform to those shown in Figure 3.

NOTE

The TTN6067A, 68A, 69A, & 70A Directional Coupler Kits are checked at 50 W input (50/100 W line on Figure 3). The TTN6071A, 72A, & 73A Directional Coupler Kits are checked at 100 W input (50/100 W line on Figure 3).

Step 3. Dekey the station and replace the wattmeter element if such readings cannot be obtained.

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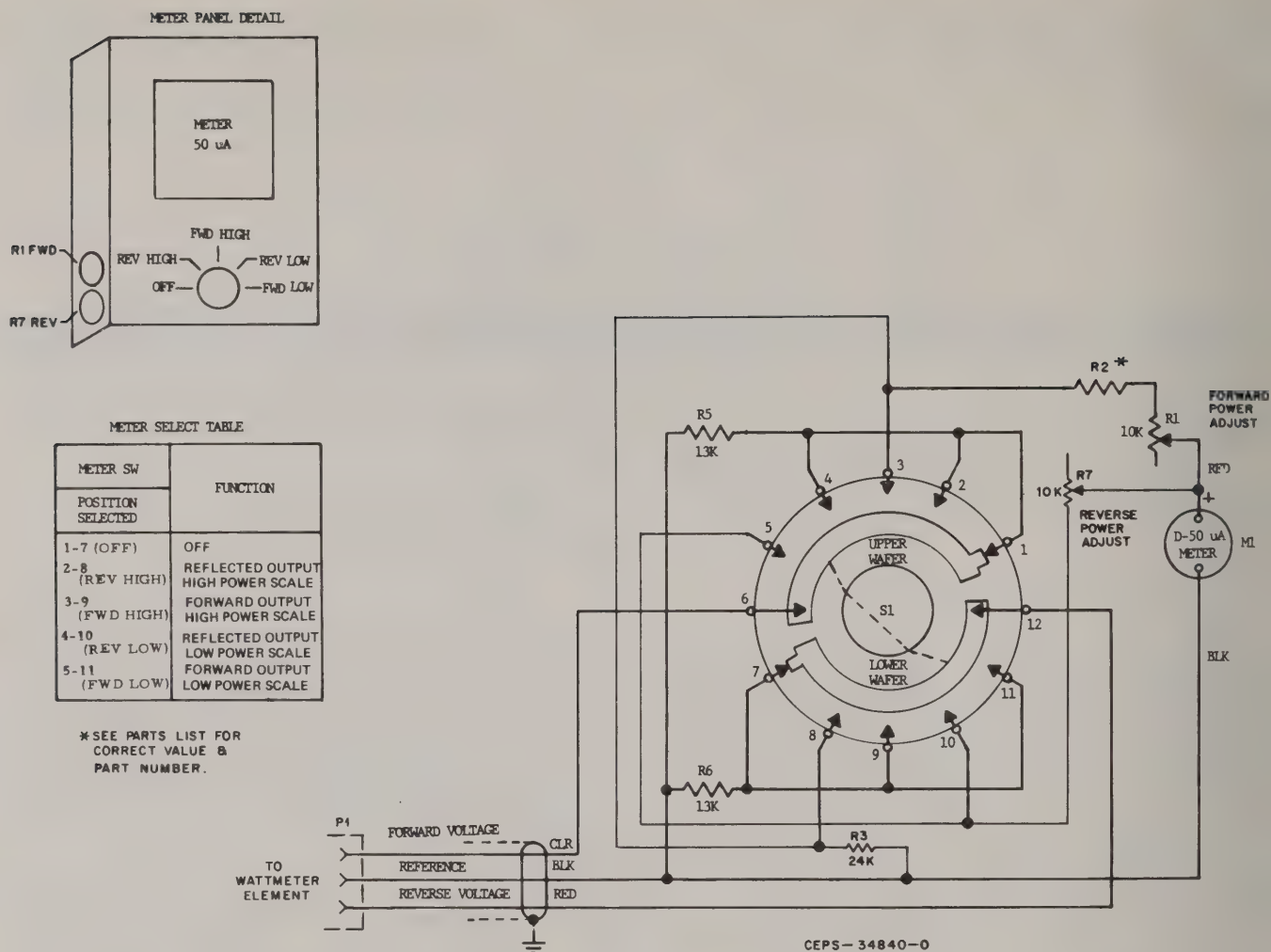


Figure 1. RF Power Meter Diagram, Meter Panel Detail
& Meter Select Table

Step 4. Repeat the procedure to ascertain that the new element is in good working condition. Dekey the station.

NOTE

The wattmeter element may falsely generate a reflected power voltage due to directivity in the element. Meter accuracy is 10% of the high full-scale deflection.

Step 5. Reduce RF power to 15 to 25 watts. Repeat Steps 2 through 4.

Step 6. Dekey the station and reconnect all cables in their proper order.

Option Chart

C47AD

TTN6074A Wattmeter Kit 25-1000 MHz, 0-150 W
 *TTN6067A Directional Coupler Kit (25-100 MHz)
 *TTN6068A Directional Coupler Kit (100-225 MHz)
 *TTN6069A Directional Coupler Kit (225-525 MHz)
 *TTN6070A Directional Coupler Kit (525-1000 MHz)

C47AE

TTN6075A Wattmeter Kit 25-525 MHz, 0-400 W
 *TTN6071A Directional Coupler Kit (25-100 MHz)
 *TTN6072A Directional Coupler Kit (100-225 MHz)
 *TTN6073A Directional Coupler Kit (225-525 MHz)

* Denotes frequency sensitive component, only one kit is used in each wattmeter kit.

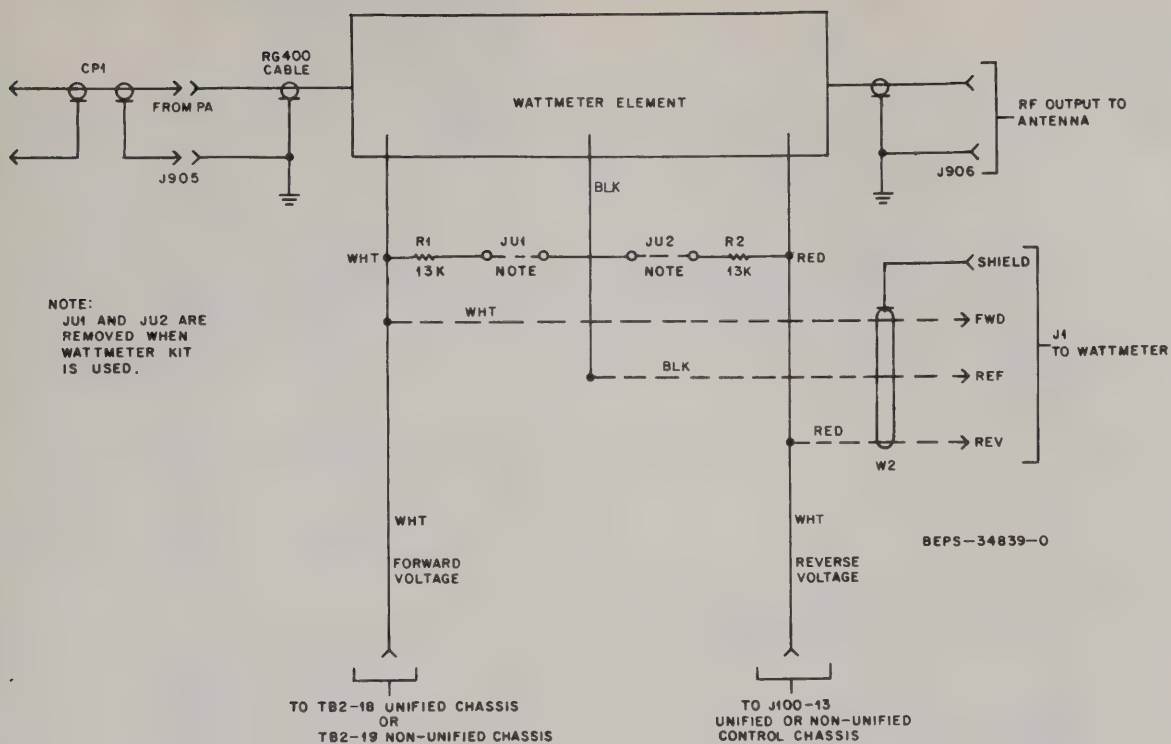


Figure 2. Directional Coupler Kit Diagram

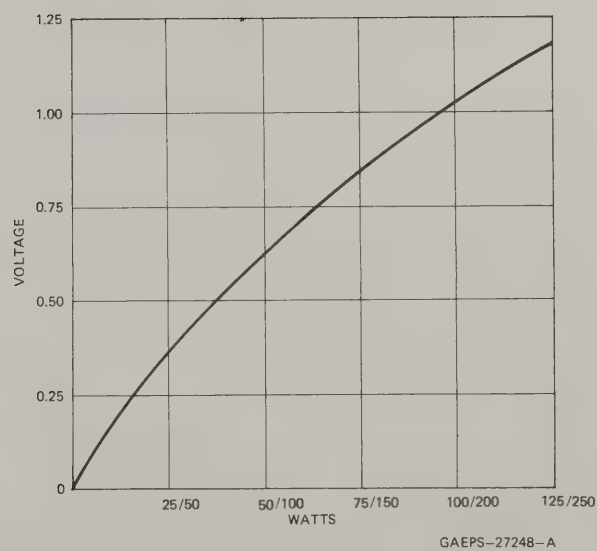


Figure 3. Wattmeter Element Voltage-vs-Power Curve

parts list

TTN6074A Wattmeter (0-150 Watt)
TTN6075A Wattmeter (0-400 Watt)

PL-8080-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
M1	72-84864B15 or 72-84864B05	meter: 0-150 W; 50 uA (TTN6074A) 0-400 W; 50 uA (TTN6075A)
P1	— 15-84860K01 29-84706E06	connector, plug: consists of: HOUSING, connector; 4-position TERMINAL, female; 3 used
R1	18-82515B41	resistor, fixed: $\pm 5\%$; 1/4 W: unless otherwise stated
R2	6-11009C79 or 6-11009C81	var. 10k 18k (TTN6074A) 22k (TTN6075A)
R3	6-11009C82	24k
R4		NOT USED
R5,6	6-11009C76	13k
R7	18-82515B41	var. 10k $\pm 20\%$
S1	40-82560H02	switch, rotary: 2-pole, 5-position
W1	30-84487C01	cable: 3-conductor; 41" used
non-referenced items		
	2-7018	NUT, hex: 3/8-32 x 1/2 x 3/32"; 3 used
	2-82360B26	NUT, speed; 2 used (TTN6073A)
	3-135038	SCREW, tapping: 14-14 x 3/4"; 2 used (TTN6073A)
	4-7698	WASHER, lock #3/8 int.
	7-84001N01	BRACKET, wattmeter
	29-82578C01	LUG, ring tongue; 2 used
	31-490142	TERMINAL STRIP
	36-82869K01	KNOB
	42-76724	CLIP, cable
	3-139564	SCREW, captive: 3/8-24 x 1/2"; 2 used (TTN6067,68,69,70A)
	4-7668	WASHER, lock 3/8 ext; 2 used (TTN6067,68,69,70A)

Directional Coupler Kit
TTN6067A 0-150 Watt, 25-100 MHz
TTN6068A 0-150 Watt, 100-225 MHz
TTN6069A 0-150 Watt, 225-525 MHz
TTN6070A 0-150 Watt, 525-1000 MHz
TTN6071A 0-400 Watt, 25-100 MHz
TTN6072A 0-400 Watt, 100-225 MHz
TTN6073A 0-400 Watt, 225-525 MHz

PL-8081-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CP1	1-80758D35	coupler, adapter: 25-100 MHz (TTN6067A, 6068A, 6071A, 6072A) includes: PLUG, adapter; right angle PLUG, coaxial; 2 used CABLE, coaxial; 13 used
	28-48250 28-84579F04 30-84173E01 or 1-80758D36	225-525 MHz (TTN6069A) includes: PLUG, right angle; 2 used CABLE, coaxial; 15 used
	28-82398E02 30-84173E01 or 1-80788D29	225-1000 MHz (TTN6070A, 6073A) includes: PLUG PLUG, right angle CABLE, coaxial; 11 used
J1	— 15-84861K01 29-84706E05	connector, receptacle: consists of: HOUSING, connector; 4-position TERMINAL, male; 3 used p/o wattmeter element
J905,906	—	
R1,2	6-11009C76	resistor, fixed: 13k $\pm 5\%$; 1/4 W
non-referenced items		
	1-80758D34	BRACKET, directional coupler; riveted
	58-84918L05	WATTMETER ELEMENT; 25-100 MHz (TTN6067A)
	58-84918L07	WATTMETER ELEMENT; 100-225 MHz (TTN6068A)
	58-84918L09	WATTMETER ELEMENT; 225-525 MHz (TTN6069A)
	58-84918L04	WATTMETER ELEMENT; 525-1000 MHz (TTN6070A)
	58-84918L06	WATTMETER ELEMENT; 25-100 MHz (TTN6071A)
	58-84918L08	WATTMETER ELEMENT; 100-225 MHz (TTN6072A)
	58-84918L10	WATTMETER ELEMENT; 225-525 MHz (TTN6073A)
	2-82360B26	NUT, speed; 2 used (TTN6071A, 6073A)
	2-82360B34	NUT, speed; 2 used (TTN6072A)
	3-135038	SCREW, tapping: 14-14 x 3/4"; 2 used (TTN6071A, 6072A, 6073A)
	3-136924	SCREW, tapping: 4-40 x 5/16"; 2 used
	3-139564	SCREW, captive: 3/8-24 x 1/2"; 2 used (TTN6067A, 6068A, 6069A, 6070A)
	4-7668	WASHER, lock: #3/8 ext; 2 used (TTN6067A, 6068A, 6069A, 6070A)
	29-812979	LUG, crimp terminal
	39-10184A24	CONTACT, receptacle
	42-10217A02	STRAP, tie; 2 used
	64-83525L01	PLATE



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PURC™
Radio Paging Stations
Control and Application

68P81060E70-A



instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81062E70-0 *PURC* Radio Paging Stations
928-960 MHz Transmit

REVISION DETAILS:

1. Change the cover page to read as follows:

PURC[™]
Radio Paging Station
928-960 MHz Transmit
125 Watts
110 W (Frequency Spacing of
1.5 to 2.25 MHz)

2. The TLN2675A (2-Frequency) and TLN2703A (3-Frequency) Multifrequency Control Modules are new units that have been added to the *PURC* station. Add the attached information to your *PURC* manual immediately following the Antenna Changeover Relay instruction section (PEPS-33548) behind the RECEIVER tab.

ATTACHMENTS:

Multifrequency Control Module
Instruction Section.....68P81065E88-0



MOTOROLA INC.

Communications
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MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

1. GENERAL DESCRIPTION

1.1 Multifrequency Control Modules TLN2675A (2 Frequency) and TLN2703A (3 Frequency) control the operating frequency of *PURC* Radio Paging Stations by selecting one of two or three paging synthesizers which are a part of the paging station. Motorola model number C75JZB1111A is a 2- frequency *PURC* radio paging station and model number C75-JZB1131A is a 3- frequency system.

1.2 The multifrequency control modules mount in standard 19-inch racks as shown in Figure 1. Table 1 shows the model complement for the multifrequency control modules. Interconnecting cabling data is given in PEPS-38154.

Table 1. Model Complement

Model	Description
TLN2675A	Multifrequency Control Module (2 Frequency)
TCN6264A	Control Board (2 Frequency)
TKN8989A	Cable Barrier Strip
TRN9039A	Chassis Hardware (2 Frequency)
TLN2703A	Multifrequency Control Module (3 Frequency)
TCN6265A	Control Board (3 Frequency)
TKN8989A	Cable Barrier Strip
TRN9127A	Chassis Hardware (3 Frequency)

1.3 RF is applied from two or three synthesizers to an rf switching network. Two frequency select signals from the simulcast control module, in conjunction with OUT-OF-LOCK INDICATE signals from the synthesizers, select which synthesizer is used. The selected synthesizer rf is applied to the exciter. The non-selected rf is attenuated by a PIN diode network.

1.4 Audio is routed from the exciter to the synthesizers. DEVIATION ADJUST potentiometers adjust the maximum deviation of each synthesizer.

2. THEORY OF OPERATION

(Refer to PEPS-38154 for schematic diagram details.)

The following description assumes a 3-frequency paging station. For a 2-frequency paging station, disregard all F3 or synthesizer 3 circuitry.

2.1 FREQUENCY SELECT AND RF SWITCHING CIRCUITRY

2.1.1 F1 SELECT (SYN 0) and F2 SELECT (SYN 1) from the simulcast control module enter at TB1-8 and TB1-9, respectively. These inputs are applied to logic network U4A, U6C, U2C, U2A, U6A, U2D, U3B, U6B, and U2B. In accordance with the truth table shown in Table 2, the output of U7B, U7C, or U7D goes high. This high turns on Q3, Q4, or Q5 causing the RF ENABLE to go low and turn on the selected synthesizer. (This condition assumes that the synthesizer is not out-of-lock as described in paragraph 2.2.)

Table 2. Synthesizer Select Truth Table

F1 Select (SYN 0)	F2 Select (SYN 1)	Synthesizer Selected
1	1	None (Station unkeyed.)
0	1	1 (U7B high)
1	0	2 (U7C high)
0	0	3 (U7D high)

2.1.2 The high from U7B, U7C, or U7D is also applied to rf switching PIN diode network CR2, CR3, CR5, CR6, CR8, and CR9 to select the desired synthesizer rf which is applied to the exciter via J4. The non-selected rf is attenuated by the PIN diode network. The PIN diode network provides an attenuation of 60 dB minimum. (Measured at 14 MHz with the output terminated into a 50 ohm spectrum analyzer and an input impedance of 50 ohms.)

2.1.3 The high from U7B, U7C, or U7D is also applied to Q6, Q7, or Q8 to turn on channel indicator LED DS1, DS2, or DS3.

technical writing services

2.1.4 Manual Select switch S1 is normally set to F1 which allows the frequency select circuitry to operate as described above. During servicing, any one of the three synthesizers can be selected by setting S1 to F1, F2, or F3 and by keying locally. When F2 or F3 are selected, DS4 flashes red on the front of the chassis to indicate that the unit is in a LOCAL F2 or LOCAL F3 servicing mode. Timer U1 determines the flashing rate of DS4.

2.2 OUT-OF-LOCK INDICATE CIRCUITRY

2.2.1 OUT-OF-LOCK INDICATE signals from the three synthesizers enter at TB1-2, TB1-3, and TB1-4. If any of the OUT-OF-LOCK INDICATE signals go low and the respective frequency is selected, Q1 turns on and the TRANSMIT INHIBIT at TB1-13 goes low to inhibit the transmitter.

2.2.2 Any low OUT-OF-LOCK INDICATE signal also turns on Q2 and relay K1 to provide a RELAY output which can be used to activate an out-of-lock alarm as desired.

2.2.3 Any low OUT-OF-LOCK INDICATE signal also turns off Q3, Q4, or Q5 (depending on which synthesizer is out-of-lock). This causes the RF ENABLE to go high and disable the respective synthesizer.

2.3 AUDIO CIRCUITRY

J5 receives audio from the exciter and applies the audio to DEVIATION ADJUST potentiometers R19, R20, and R21. The DEVIATION ADJUST potentiometers set the maximum deviation level of the audio applied to the synthesizers.

3. MULTIFREQUENCY TRANSMITTER ALIGNMENT

3.1 SYNTHESIZERS

Align each synthesizer per Paging Synthesizer instruction section 68P81062E72 *PURC* Radio Paging Stations Control and Application Manual 68P81060E70.

3.2 EXCITER

Align the exciter per instructions in Exciter instruction section 68P81063E18 in manual 68P81062E70 at the lowest transmitter frequency.

3.3 INTERMEDIATE POWER AMPLIFIER (IPA)

Align the IPA per instructions in IPA instruction section 68P81063E21 of manual 68P81062E70 at the lowest transmitter frequency.

3.4 FINAL POWER AMPLIFIER (FPA)

Align the FPA per instructions in FPA instruction section 68P81063E24 of manual 68P81062E70 at the lowest transmitter frequency. Then perform the following procedure.

3.4.1 Multifrequency PA Tuning

Step 1. Note the power output level at the lowest frequency.

Step 2. Select the highest frequency and note the loss in power output level from Step 1.

Step 3. Turn the output tuning knob inward until 1/2 the loss noted in Step 2 is recovered.

Step 4. Select the lowest frequency and note any change in output power from Step 3.

Step 5. Turn the output tuning knob until 1/2 the loss in output power noted in Step 4 is recovered.

Step 6. Repeat Steps 1 through 5 until the difference in the power between the highest and lowest power is 2 watts or less.

Step 7. If there is a mid-frequency, select it. If output power is greater than 125 watts, reduce plate current to achieve 125 watts.

Step 8. Tighten down the output coupling and tuning controls. Tighten the input coupling shaft and tuning control.

3.4.2 Power Degradation for Multifrequency Stations

Adjust plate current control to achieve output power levels per table below.

Frequency Spacing	Radio Power Output
0 to 1-1/2 MHz	125 Watts
1-1/2 to 2-1/4 MHz	110 Watts

4. DEVIATION SETTING

To set maximum deviation, proceed as follows.

Step 1. Turn the exciter IDC control (R410) fully clockwise.

Step 2. Adjust the DEVIATION ADJUST controls, accessible through the front of the multifrequency control chassis, for ± 5 kHz deviation. Do this for each frequency as shown below.

Frequency	Deviation Adjust (IDC) Control
F1	R19
F2	R20
F3	R21

5. JUMPER INFORMATION

5.1 MULTIFREQUENCY CONTROL MODULE TLN2675A AND TLN2703A

Jumpers are wired for either 2-frequency (TLN2675A) or 3-frequency (TLN2703A) operation as follows:

Jumper	2-Frequency	3-Frequency
JU1	OUT	OUT
JU2	IN	IN
JU3	OUT	IN

5.2 SIMULCAST CONTROL MODULE TLN2559B

JU2 is IN for single frequency operation and OUT for multifrequency operations.

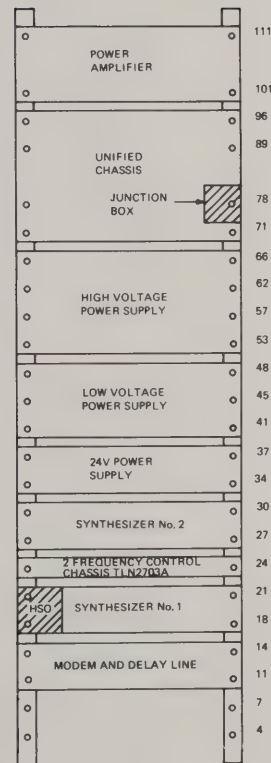
5.3 STATION CONTROL MODULE TRN4854B

JU4 is IN for multifrequency operation. JU4 is OUT for single frequency operation when using a TLN2559B Simulcast Control Module. JU4 is IN for single frequency operation when using a TLN2559A Simulcast Control Module.

RE RACKED IN FRONT OF
A 70 INCH CABINET.
S AT RIGHT EDGE OF
E SCREW HOLE NUMBERS.

MULTIFREQUENCY CONTROL MODULE

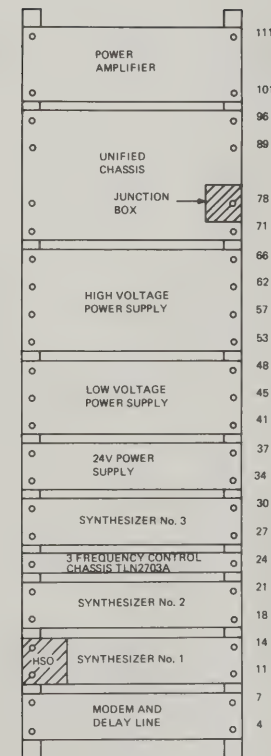
Figure 1. PURC Radio Paging Station Rack Layout



- NOTES:
1. UNITS ARE RACKED IN FRONT OF RAILS IN A 70 INCH CABINET.
 2. NUMBERS AT RIGHT EDGE OF RACK ARE SCREW HOLE NUMBERS.

BEPS-37918-0

2 FREQUENCY LAYOUT



- NOTES:
1. UNITS ARE RACKED IN FRONT OF RAILS IN A 70 INCH CABINET.
 2. NUMBERS AT RIGHT EDGE OF RACK ARE SCREW HOLE NUMBERS.

BEPS-37917-0

3 FREQUENCY LAYOUT

Figure 1. PURC Radio Paging Station Rack Layout

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

INTERCONNECTING

PART NUMBERS FOR THE IN
S AS FOLLOWS.

E ON	PART NO.
	1- 80759D83
	1- 80759D84
	1- 80778D97
	1- 80778D99
	NOT USED
	1- 80779D01
	P/O 1- 80778D98

ASSIS
DETAIL



W

CONTROL CHA
LEGEND DET

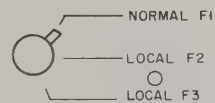


REAR VIEW

DEVIATION ADJUST



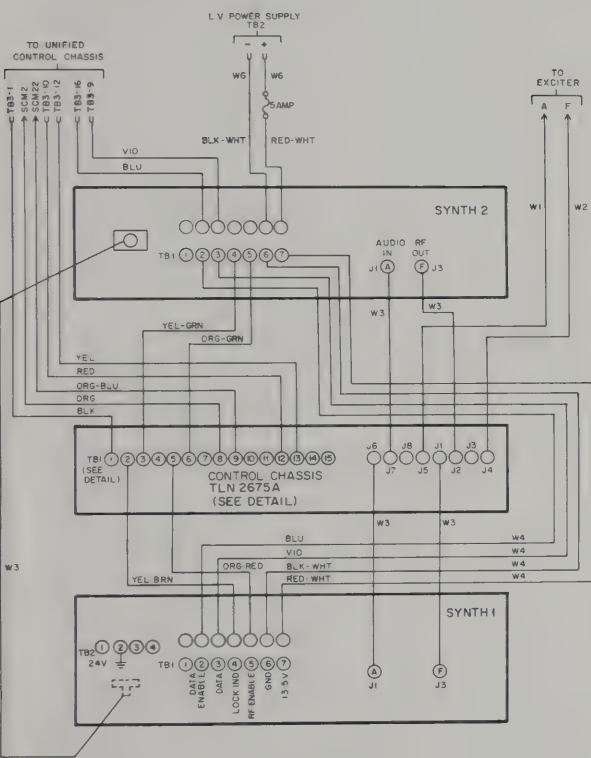
FRONT VIEW



MULTIFREQUENCY CONTROL MODULE

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

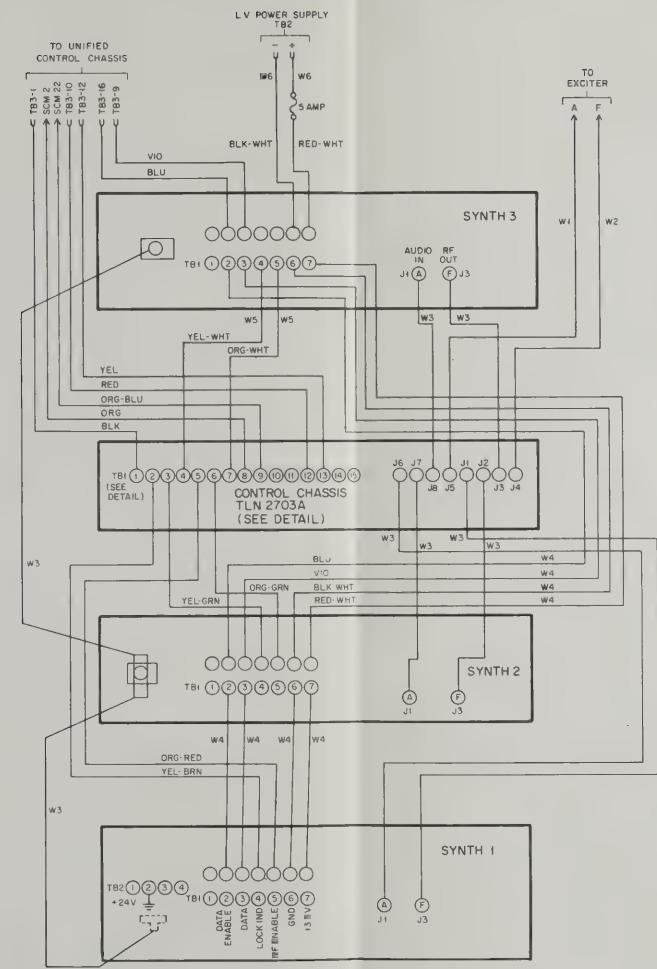
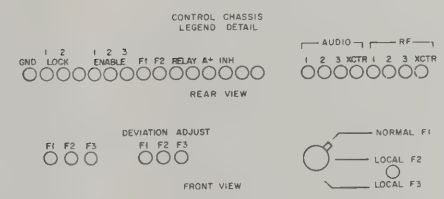


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DEPS-37884-0

2-FREQUENCY INTERCONNECTING CABLING

NOTE
MOTOROLA PART NUMBERS FOR THE INTERCONNECTING CABLING IS AS FOLLOWS

REFERENCE DESIGNATION	PART NO.
W1	1-80759083
W2	1-80759084
W3	1-80778097
W4	1-80778099
W5	NOT USED
W6	1-80779001 P/O 1-80778098

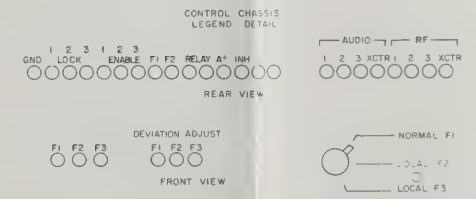


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DEPS-37885-0

3-FREQUENCY INTERCONNECTING CABLING

NOTE
MOTOROLA PART NUMBERS FOR THE INTERCONNECTING CABLING IS AS FOLLOWS

REFERENCE DESIGNATION	PART NO.
W1	1-80759083
W2	1-80759084
W3	1-80778097
W4	1-80778099
W5	1-80781031
W6	1-80779001 P/O 1-80778098



parts list

TCN6264A Control Board (2-Frequency)
TCN6265A Control Board (3-Frequency)

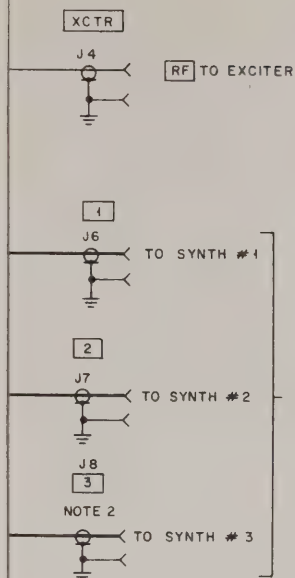
PL-8688-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1 thru 5	21-11015A07	capacitor, fixed; uF: .01 + 80 – 20%
C6		NOT USED
C7, 8	21-11015A07	.01 + 80 – 20%
C9		NOT USED
C10	23-84538G06	47 ± 20%; 20 V
C11	23-84538G04	15 ± 20%; 20 V
C12	21-11015A07	.01 + 80 – 20%
CR1		diode: (see note) NOT USED
CR2, 3	48-83510F03	silicon
CR4		NOT USED
CR5, 6	48-83510F03	silicon
CR7		NOT USED
CR8, 9	48-83510F03	silicon
CR10, 11	48-83654H01	silicon
CR12	48-82466H13	silicon
DS1 thru 3	48-88245C29	light emitting diode: (see note) green
DS4	48-88245C28	red
J1 thru 8	29-80014A01	connector: TERMINAL, coaxial cable
K1	80-82617M11	relay: 1 form "C"; coil res. 800
L1 thru 5	24-82135G10	coil, rf: choke; 100 uH
P1	28-83143M03	connector, plug: male; 14-contact
Q1 thru 8	48-869642	transistor: (see note) NPN: type M9642
R1, 2		resistor, fixed ± ; 1/4 W: unless otherwise stated
R3, 4	6-11009C49	NOT USED
R5, 6	6-11009C43	1k
R7, 8		560
R9, 10	6-11009C49	NOT USED
R11 thru 14		1k
R15, 16	6-11009C49	NOT USED
R17, 18		1k
R19, 20, 21	18-83452F19	variable; 100k
R22	6-125B70	1; 1/2 W
R23	6-11009C65	4.7k
R24	6-11009C69	6.8k
R25	6-11009C81	22k
R26	6-11009C65	4.7k
R27	6-11009C47	820
R28	6-11009C49	1k
R29	6-11009C47	820
R30	6-11009C49	1k
R31	6-11009C47	820
R32	6-11009C49	1k
R33	6-11009C47	820
R34 thru 38	6-11009C65	4.7k
R39, 40, 41	6-11009C61	3.3k
R42	6-11009C49	1k
R43	6-11009C37	330
R44	6-11009C49	1k
R45	6-11009C37	330
R46	6-11009C65	4.7k
R47, 48	6-11009C49	1k
R49, 50, 51	6-11009C73	10k
S1	40-83658N01	switch: rotary; 5 position
U1	51-84561L23	integrated circuit: (see note) timer
U2, 3	51-82884L04	quad 2-input NOR gate
U4	51-82884L17	triple 3-input NOR gate
U5, 6	51-82884L02	hex non-inverting buffer
U7	51-83629M08	quad operational amplifier
mechanical parts		
	3-138162	SCREW, tapping: 4-40 × 3/8"; 6 used
	42-84284B01	RETAINER; 6 used
	1-80778D92	CABLE Assembly, short; 2 used TCN6264A, 3 used TCN6265A; includes:
	9-84968D01	CONNECTOR, female; single contact
	30-83794C01	CABLE, coaxial (WHT) 6"
	1-80778D93	CABLE Assembly, long; 4 used TCN6264A, 5 used TCN6265A; includes:
	9-84968D01	CONNECTOR, female; single contact
	30-83794C01	CABLE, coaxial (WHT); 8-1/2"

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)



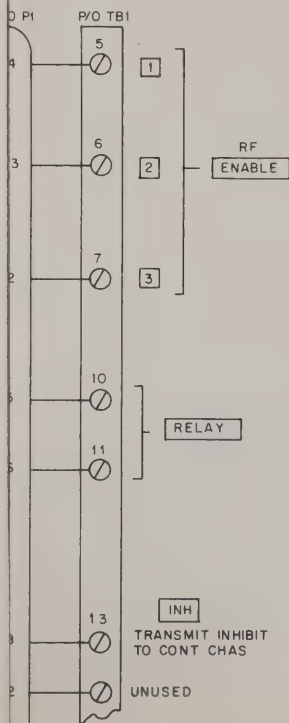
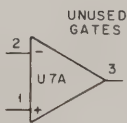
NOTES:

1. Unless otherwise specified, all resistors are in ohms; all capacitors are in microfarads; and all inductors are in microhenries.
2. J3 and J8 are installed in TCN6265A Models only.
3. DS4 flashes when S1 selects LOCAL F2 or LOCAL F3. DS4 is off when S1 selects normal F1.
4. Integrated circuit connections for this board are as follows:

Reference Designation	Mfr's Description	A +	GND
U1	Timer	8	1
U2, U3	Quad 2-Input NOR Gate	14	7
U4	Triple 3-Input NOR Gate	14	7
U5, U6	Hex Inverter Buffer	1	8
U7	Quad Op Amp	4	11

5. Jumpers are wired for either 2-frequency or 3-frequency operation as follows:

Jumper	2-Frequency	3-Frequency
JU1	OUT	OUT
JU2	IN	IN
JU3	OUT	IN



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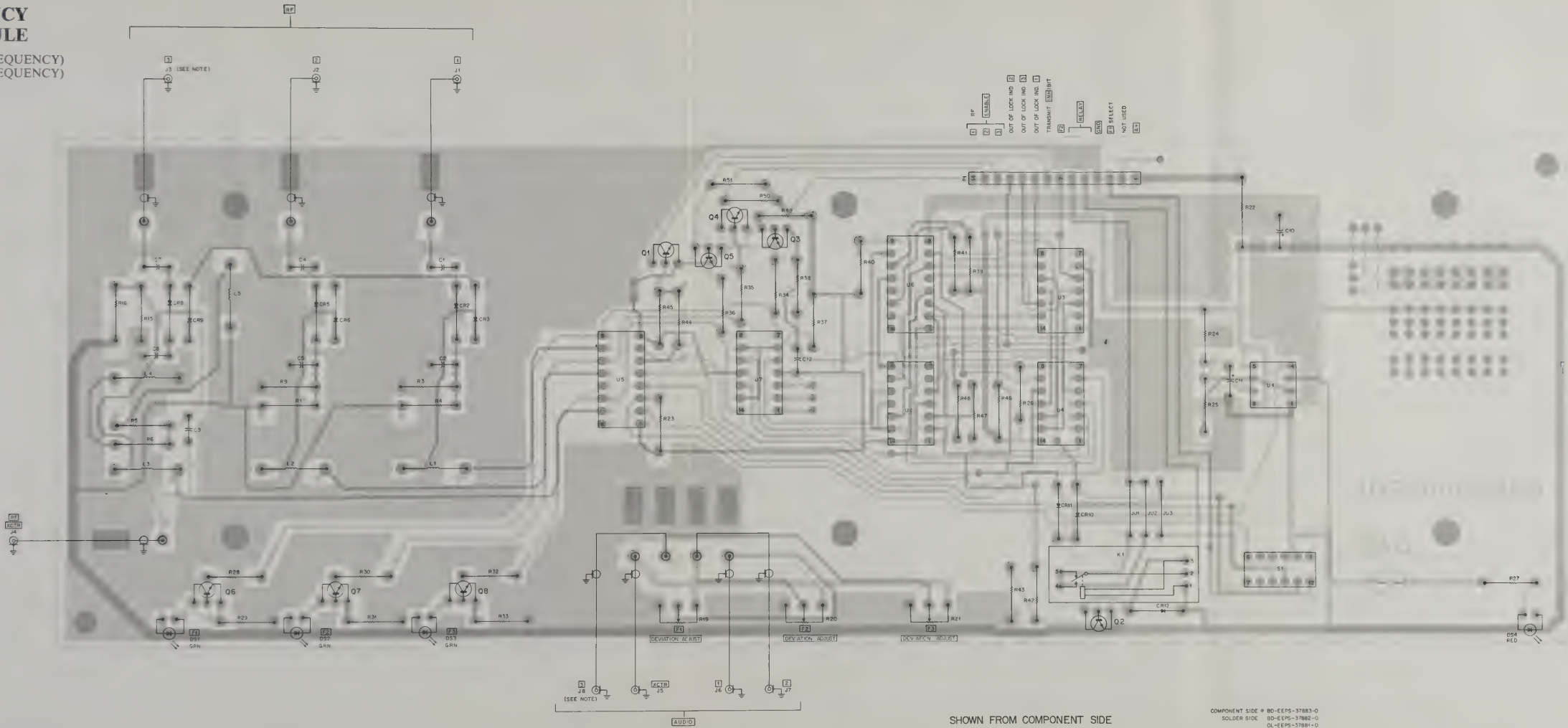
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(Sheet 3 of 3)
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MULTIFREQUENCY CONTROL MODULE

MULTIFREQUENCY
CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

Motorola No. PEPS-38154-O
(Sheet 2 of 3)
11 11 83- PH1



parts list

TCN624A Control Board (2-Frequency)
TCN625A Control Board (3-Frequency)
PL-8488-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1 thru 5	21-11015A07	capacitor, three, uF
C6	NOT USED	.01 + 80 - 20%
C7, 8	21-11015A07	NOT USED
C9	23-84538G06	.01 + 80 - 20%
C10	23-84538G06	47 ± 20%, 20 V
C11	23-84538G04	15 ± 20%, 20 V
C12	21-11015A07	.01 + 80 - 20%
CR1	48-83510F03	diode (see note)
CR2, 3	NOT USED	NOT USED
CR4	48-83510F03	silicon
CR5, 6	NOT USED	NOT USED
CR7	48-83510F03	silicon
CR8, 9	48-83510F03	silicon
CR10, 11	48-83545H01	silicon
CR12	48-82466H13	silicon
DS1 thru 3	48-88245C29	light emitting diode (see note)
DS4	48-88245C28	green
J1 thru 8	29-80014A01	connector, terminal, coaxial cable
K1	80-82617M11	relay
L1 thru 5	24-82135G10	1 form "C", coil res. 800
P1	28-83143M03	coil, rt. choke, 100 uH
Q1 thru 8	48-889642	connector, plug male; 14-contact
R1, 2	6-11009C49	transistor (see note)
R3, 4	6-11009C43	NPN type M9642
R5, 6	6-11009C43	resistor, fixed ± 1/4 W
R7, 8	6-11009C49	unless otherwise stated
R8, 10	6-11009C49	NOT USED
R11 thru 14	6-11009C49	1k
R15, 16	6-11009C49	NOT USED
R17, 18	6-11009C49	1k
R19, 20, 21	18-83452F19	NOT USED
R22	6-125B70	variable, 100k
R23	6-11009C05	1, 1/2 W
R24	6-11009C06	4.7k
R25	6-11009C08	6.8k
R26	6-11009C08	22k
R27	6-11009C05	4.7k
R28	6-11009C47	820
R29	6-11009C49	1k
R30	6-11009C47	820
R31	6-11009C49	1k
R32	6-11009C47	820
R33	6-11009C49	1k
R34 thru 38	6-11009C05	4.7k
R39, 40, 41	6-11009C08	3.3k
R42	6-11009C49	1k
R43	6-11009C37	330
R44	6-11009C49	1k
R45	6-11009C37	330
R46	6-11009C05	4.7k
R47, 48	6-11009C49	1k
R49, 50, 51	6-11009C73	10k
S1	40-83658N01	switch, rotary, 5 position
U1	51-84561L23	integrated circuit (see note)
U2, 3	51-82884L04	timer
U4	51-82884L17	quad 2-input NOR gate
U5, 6	51-82884L02	triple 3-input NOR gate
U7	51-83629M08	hex non-inverting buffer
U8	51-83629M08	quad operational amplifier
mechanical parts		
3-135163	SCREW, tapping, 4-40 x 3/8", 6 used	
42-84284B01	RETAINER, 5 used	
1-80778D02	CABLE Assembly, short, 2 used TCN6264A, 2 used TCN625A, includes	
9-84968D01	CONNECTOR, female, single contact	
30-83794C01	CABLE, coaxial (WHT), 6"	
1-80778D03	CABLE Assembly, long, 4 used TCN6264A, 5 used TCN625A, includes	
9-84968D01	CONNECTOR, female, single contact	
30-83794C01	CABLE, coaxial (WHT), 6-1/2"	

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers

TKN8955A Assembly Cable (2-Frequency)
TKN8999A Assembly Cable (3-Frequency) PL-8778-C

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		cable
W1	1.60759C03 28.63999K1	AUDIO Cable Assembly, includes CONNECTOR, male single contact, 2 used
	30.63794C01 SL 672603C02	CABLE, coaxial (WHT), 80' used SLEEVE, 1/2" x 3.62" (WHT), 20 used
	1.60759C04 28.63999K1	RF Cable Assembly, includes CONNECTOR, male single contact, 2 used
	30.63794C01 SL 672603C02	CABLE, coaxial (WHT), 80' used SLEEVE, 1/2" x 3.62" (WHT), 20 used
	*C80759C01	CABLE (172) Assembly, includes CONNECTOR, male single contact, 2 used
	30.65794C03	CABLE, coaxial (WHT), 12" used
	1.60759D09	Bus Assembly interconnect, includes CONNECTOR, 3-Freq., 1 used
W2	28.612974	hug. crimp terminal, 4 used
W3	30.6781D31	hug. interconnect, 3-Freq., 1 used
	28.612974	hug. crimp terminal, 4 used
W6	1.60780P01	STRAP, tie 091 x 3.62" (WHT), 4 used
	4.62882A01	BODY, fuseloider
	1.62886A01	CAP, fuseloider
	4.62885A01	SPRING, fuseloider
	28.612974	hug. crimp terminal, 4 used
	4.62882A01	STRAP, tie 091 x 3.62" (WHT), 4 used
	4.62884A01	CLIP, fuse, 2 used
	35.652974	FUSE, 3.5mm x 250V
	1.60759D08	CABLE Assembly, connector, includes RECEPTACLE, crimp, 2 used
	28.612974	hug. crimp terminal, 20 used
	1.62803D60	SLEEVE, coupling, blank, 2 used
	4.62812A01	STRAP, tie 091 x 3.62" (WHT), 20 used

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
2 82360B34		NUT, speed 1/4-14, 6 used
3 135038		SCREW, tapping 14-14 x 3/4", 6 used
9-82578B01		CONNECTOR, "T"
47-82977P01		ROD, slide synthesizer; 2 used
54-83261P01		LABEL channel and frequency

TKN8214A Modem Cable
TKN8998A 60" Modem Cable PL-87754

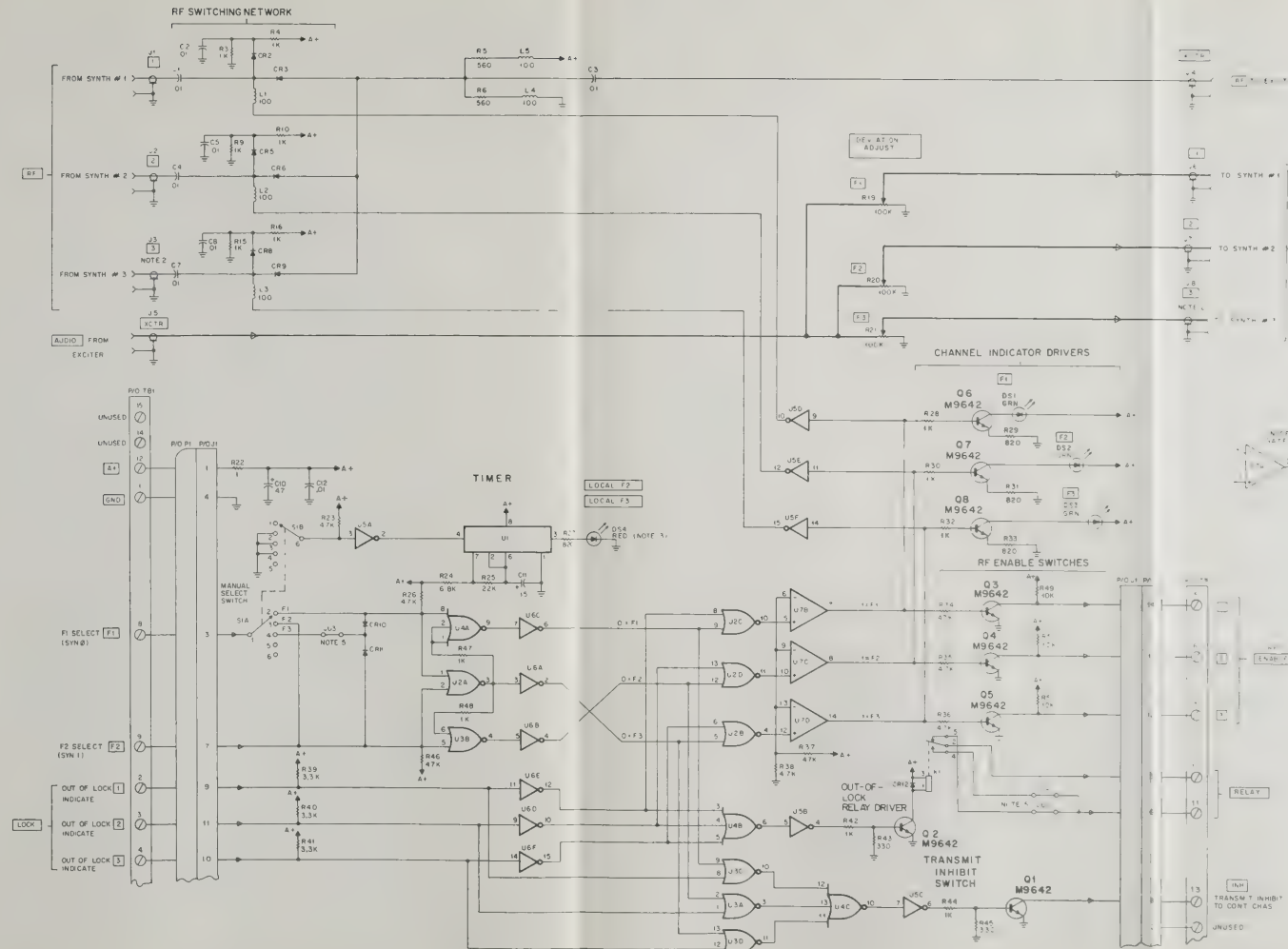
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-807810-30	MODEM Cable Assembly 80" (TKN8998A) includes
	28-445020E1	HOOD connector
	28-44506E1	CONNECTOR, male: 25 contact
	29-412979	UG, crimp terminal: 4 used
	29-40716801	UG, flanged spade
	4-1021742-02	STRAP, tie: .091 x .362" (WH1); 11 used
	1-80742D35	MODEM Cable Assembly (TKN8214A) includes
	1-844502E1	HOOD connector
	28-44506E1	CONNECTOR, male: 25-contact
	29-412979	UG, crimp terminal: 4 used
	29-40716801	UG, flanged spade
	4-1021742-02	STRAP, tie: .091 x .362" (WH1); 10 used

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1331861	SCREW, TORX 4.40 X 3/8", 2 used
	442428401	RETAINER, 2 used
	75-02300301	PAID, knob
	9-0400300	EVLCT, 2 used
	15-0531200	COVER, chain element
	91760304	SCREW, 1/4" x 1/2" Assembly included:
	9-03060204	SOCKET
	944966001	CONNECTOR, female single contact (BNC) 2 used
	86-0254401	SWITCH, oscillator
	3031794201	CABLE, 1/4" BNC, 1/16" WHT, 1' 1 used
	37-109120	GROMMET, knob
	35-02510606 "A"	SLEEVING, cover 1" x 1"
	37-06200303 "A"	SLEEVING, cover 1" x 1"
	2-0260304	NUT, spec 14-14, 18 used
	31-55058	SCREW, 1/4" x 1/2" 348 used
	1476417200	BRACKET, rack
	30-0070001	CONSOLE, 1 used
	42-1021701A	STRAP, tie 0.184 x 775", 2 used
	47-025701	ROD, side support, 2 used
	14-026106	LABEY, 1 used

TRN9039A Chassis Hardware (2-Frequency)
TRN9127A Chassis Hardware (3-Frequency)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
3-129997		SCREW, machine: 4-40 x 5/16"; 3 used
3-136850		SCREW, tapping: 8-32 x 1/2"; 4 used
27-82978P01		CHASSIS
36-83565P01		KNOB, control
42-84284P01		RETAINER; 3 used
15-82979P01		COVER
38-010388		BUTTON, plug; 2 used (TRN0030A only)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P1	15-83142M03	connector, receptacle; HOUSING, 14-contact
TB1	31-824738	terminal board; 15 terminals
		mechanical parts
	39-82717M01 42-10217A02	CONTACT, receptacle; 13 used STRAP, tie: .091 x 3.82(WHT); 6 used



- NOTES
1. Unless otherwise specified, all values are in inches (mm) and all dimensions are in millimeters.
 2. J3 and J8 are installed in TCN6265A Models only.
 3. DS4 flashes when S1 selects LOCAL F2 or LOCAL F3. DS4 is off when S1 selects normal F1.
 4. Integrated circuit connections for this board are as follows:

Reference Designation	Chip's Description	A+	GND
U1	Timer	8	
U2, U3	Quad 2 Input NOR Gate	14	7
U4	Triple 3 Input NOR Gate	14	
U5, U6	Hex Inverter Buffer	1	8
U7	Quad 2 Input	2	

Jumper	2-Frequency	3-Frequency
JU1	IN	IN
JU2	IN	IN
JU3	OUT	IN

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81062E70-0 *PURC* Radio Paging Stations
928-960 MHz Transmit

REVISION DETAILS:

1. Change the cover page to read as follows:

PURC™
Radio Paging Station
928-960 MHz Transmit
125 Watts
110 W (Frequency Spacing of
1.5 to 2.25 MHz)

2. The TLN2675A (2-Frequency) and TLN2703A (3-Frequency) Multifrequency Control Modules are new units that have been added to the *PURC* station. Add the attached information to your *PURC* manual immediately following the Antenna Changeover Relay instruction section (PEPS-33548) behind the RECEIVER tab.

ATTACHMENTS:

Multifrequency Control Module
Instruction Section.....68P81065E88-0



MOTOROLA INC.

Communications
Sector

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

1. GENERAL DESCRIPTION

1.1 Multifrequency Control Modules TLN2675A (2 Frequency) and TLN2703A (3 Frequency) control the operating frequency of *PURC* Radio Paging Stations by selecting one of two or three paging synthesizers which are a part of the paging station. Motorola model number C75JZB1111A is a 2-frequency *PURC* radio paging station and model number C75-JZB1131A is a 3-frequency system.

1.2 The multifrequency control modules mount in standard 19-inch racks as shown in Figure 1. Table 1 shows the model complement for the multifrequency control modules. Interconnecting cabling data is given in PEPS-38154.

Table 1. Model Complement

Model	Description
TLN2675A	Multifrequency Control Module (2 Frequency)
TCN6264A	Control Board (2 Frequency)
TKN8989A	Cable Barrier Strip
TRN9039A	Chassis Hardware (2 Frequency)
TLN2703A	Multifrequency Control Module (3 Frequency)
TCN6265A	Control Board (3 Frequency)
TKN8989A	Cable Barrier Strip
TRN9127A	Chassis Hardware (3 Frequency)

1.3 RF is applied from two or three synthesizers to an rf switching network. Two frequency select signals from the simulcast control module, in conjunction with OUT-OF-LOCK INDICATE signals from the synthesizers, select which synthesizer is used. The selected synthesizer rf is applied to the exciter. The non-selected rf is attenuated by a PIN diode network.

1.4 Audio is routed from the exciter to the synthesizers. DEVIATION ADJUST potentiometers adjust the maximum deviation of each synthesizer.

2. THEORY OF OPERATION

(Refer to PEPS-38154 for schematic diagram details.)

The following description assumes a 3-frequency paging station. For a 2-frequency paging station, disregard all F3 or synthesizer 3 circuitry.

2.1 FREQUENCY SELECT AND RF SWITCHING CIRCUITRY

2.1.1 F1 SELECT (SYN 0) and F2 SELECT (SYN 1) from the simulcast control module enter at TB1-8 and TB1-9, respectively. These inputs are applied to logic network U4A, U6C, U2C, U2A, U6A, U2D, U3B, U6B, and U2B. In accordance with the truth table shown in Table 2, the output of U7B, U7C, or U7D goes high. This high turns on Q3, Q4, or Q5 causing the RF ENABLE to go low and turn on the selected synthesizer. (This condition assumes that the synthesizer is not out-of-lock as described in paragraph 2.2.)

Table 2. Synthesizer Select Truth Table

F1 Select (SYN 0)	F2 Select (SYN 1)	Synthesizer Selected
1	1	None (Station unkeyed.)
0	1	1 (U7B high)
1	0	2 (U7C high)
0	0	3 (U7D high)

2.1.2 The high from U7B, U7C, or U7D is also applied to rf switching PIN diode network CR2, CR3, CR5, CR6, CR8, and CR9 to select the desired synthesizer rf which is applied to the exciter via J4. The non-selected rf is attenuated by the PIN diode network. The PIN diode network provides an attenuation of 60 dB minimum. (Measured at 14 MHz with the output terminated into a 50 ohm spectrum analyzer and an input impedance of 50 ohms.)

2.1.3 The high from U7B, U7C, or U7D is also applied to Q6, Q7, or Q8 to turn on channel indicator LED DS1, DS2, or DS3.

technical writing services

2.1.4 Manual Select switch S1 is normally set to F1 which allows the frequency select circuitry to operate as described above. During servicing, any one of the three synthesizers can be selected by setting S1 to F1, F2, or F3 and by keying locally. When F2 or F3 are selected, DS4 flashes red on the front of the chassis to indicate that the unit is in a LOCAL F2 or LOCAL F3 servicing mode. Timer U1 determines the flashing rate of DS4.

2.2 OUT-OF-LOCK INDICATE CIRCUITRY

2.2.1 OUT-OF-LOCK INDICATE signals from the three synthesizers enter at TB1-2, TB1-3, and TB1-4. If any of the OUT-OF-LOCK INDICATE signals go low and the respective frequency is selected, Q1 turns on and the TRANSMIT INHIBIT at TB1-13 goes low to inhibit the transmitter.

2.2.2 Any low OUT-OF-LOCK INDICATE signal also turns on Q2 and relay K1 to provide a RELAY output which can be used to activate an out-of-lock alarm as desired.

2.2.3 Any low OUT-OF-LOCK INDICATE signal also turns off Q3, Q4, or Q5 (depending on which synthesizer is out-of-lock). This causes the RF ENABLE to go high and disable the respective synthesizer.

2.3 AUDIO CIRCUITRY

J5 receives audio from the exciter and applies the audio to DEVIATION ADJUST potentiometers R19, R20, and R21. The DEVIATION ADJUST potentiometers set the maximum deviation level of the audio applied to the synthesizers.

3. MULTIFREQUENCY TRANSMITTER ALIGNMENT

3.1 SYNTHESIZERS

Align each synthesizer per Paging Synthesizer instruction section 68P81062E72 *PURC* Radio Paging Stations Control and Application Manual 68P81060E70.

3.2 EXCITER

Align the exciter per instructions in Exciter instruction section 68P81063E18 in manual 68P81062E70 at the lowest transmitter frequency.

3.3 INTERMEDIATE POWER AMPLIFIER (IPA)

Align the IPA per instructions in IPA instruction section 68P81063E21 of manual 68P81062E70 at the lowest transmitter frequency.

3.4 FINAL POWER AMPLIFIER (FPA)

Align the FPA per instructions in FPA instruction section 68P81063E24 of manual 68P81062E70 at the lowest transmitter frequency. Then perform the following procedure.

3.4.1 Multifrequency PA Tuning

Step 1. Note the power output level at the lowest frequency.

Step 2. Select the highest frequency and note the loss in power output level from Step 1.

Step 3. Turn the output tuning knob inward until 1/2 the loss noted in Step 2 is recovered.

Step 4. Select the lowest frequency and note any change in output power from Step 3.

Step 5. Turn the output tuning knob until 1/2 the loss in output power noted in Step 4 is recovered.

Step 6. Repeat Steps 1 through 5 until the difference in the power between the highest and lowest power is 2 watts or less.

Step 7. If there is a mid-frequency, select it. If output power is greater than 125 watts, reduce plate current to achieve 125 watts.

Step 8. Tighten down the output coupling and tuning controls. Tighten the input coupling shaft and tuning control.

3.4.2 Power Degradation for Multifrequency Stations

Adjust plate current control to achieve output power levels per table below.

Frequency Spacing	Radio Power Output
0 to 1-1/2 MHz	125 Watts
1-1/2 to 2-1/4 MHz	110 Watts

4. DEVIATION SETTING

To set maximum deviation, proceed as follows.

Step 1. Turn the exciter IDC control (R410) fully clockwise.

Step 2. Adjust the DEVIATION ADJUST controls, accessible through the front of the multifrequency control chassis, for ± 5 kHz deviation. Do this for each frequency as shown below.

Frequency	Deviation Adjust (IDC) Control
F1	R19
F2	R20
F3	R21

5. JUMPER INFORMATION

5.1 MULTIFREQUENCY CONTROL MODULE TLN2675A AND TLN2703A

Jumpers are wired for either 2-frequency (TLN2675A) or 3-frequency (TLN2703A) operation as follows:

Jumper	2-Frequency	3-Frequency
JU1	OUT	OUT
JU2	IN	IN
JU3	OUT	IN

5.2 SIMULCAST CONTROL MODULE TLN2559B

JU2 is IN for single frequency operation and OUT for multifrequency operations.

5.3 STATION CONTROL MODULE TRN4854B

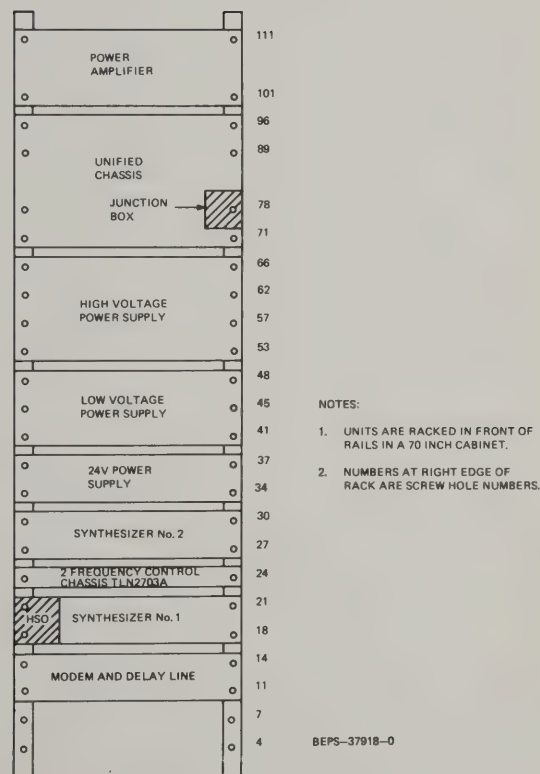
JU4 is IN for multifrequency operation. JU4 is OUT for single frequency operation when using a TLN2559B Simulcast Control Module. JU4 is IN for single frequency operation when using a TLN2559A Simulcast Control Module.

RE RACKED IN FRONT OF
A 70 INCH CABINET.

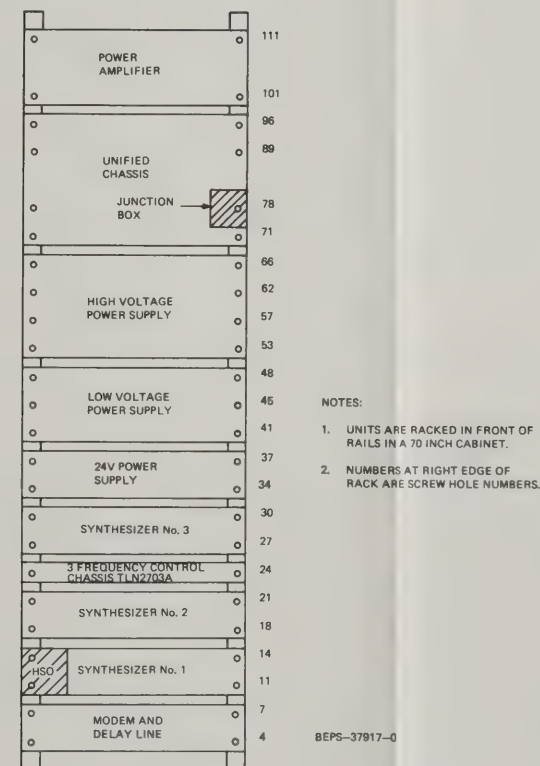
S AT RIGHT EDGE OF
E SCREW HOLE NUMBERS.

MULTIFREQUENCY CONTROL MODULE

Figure 1. PURC Radio Paging Station Rack Layout



2 FREQUENCY LAYOUT



3 FREQUENCY LAYOUT

Figure 1. PURC Radio Paging Station Rack Layout

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

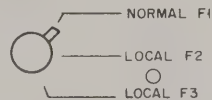
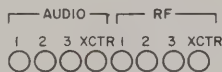
INTERCONNECTING

PART NUMBERS FOR THE IN
S AS FOLLOWS.

DESCRIPTION	PART NO.
1- 80759D83	
1- 80759D84	
1- 80778D97	
1- 80778D99	
NOT USED	
1- 80779D01	
P/O 1- 80778D98	

ASSIS
DETAIL

CONTROL CHA
LEGEND DET



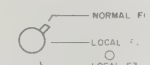
MULTIFREQUENCY CONTROL MODULE

MULTIFREQUENCY CONTROL MODULE



Diagram illustrating the connection of a three-terminal device (represented by a circle) to the system:

- NORMAL F
- LOCAL F2
- LOCAL F3



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parts list

TCN6264A Control Board (2-Frequency)
TCN6265A Control Board (3-Frequency)

PL-8688-O

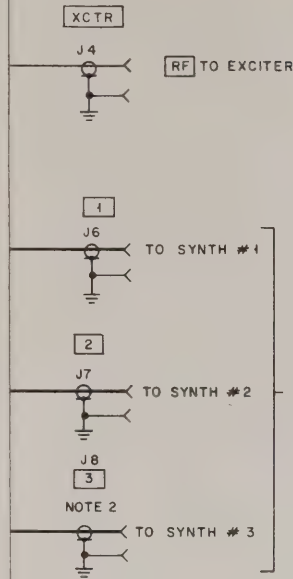
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1 thru 5	21-11015A07	capacitor, fixed; uF: .01 + 80 – 20%
C6		NOT USED
C7, 8	21-11015A07	.01 + 80 – 20%
C9		NOT USED
C10	23-84538G06	47 ± 20%; 20 V
C11	23-84538G04	15 ± 20%; 20 V
C12	21-11015A07	.01 + 80 – 20%
CR1		diode: (see note) NOT USED
CR2, 3	48-83510F03	silicon
CR4		NOT USED
CR5, 6	48-83510F03	silicon
CR7		NOT USED
CR8, 9	48-83510F03	silicon
CR10, 11	48-83654H01	silicon
CR12	48-82466H13	silicon
DS1 thru 3	48-88245C29	light emitting diode: (see note) green
DS4	48-88245C28	red
J1 thru 8	29-80014A01	connector: TERMINAL, coaxial cable
K1	80-82617M11	relay: 1 form “C”; coil res. 800
L1 thru 5	24-82135G10	coil, rf: choke; 100 uH
P1	28-83143M03	connector, plug: male; 14-contact
Q1 thru 8	48-869642	transistor: (see note) NPN: type M9642
R1, 2		resistor, fixed ± ; 1/4 W: unless otherwise stated NOT USED
R3, 4	6-11009C49	1k
R5, 6	6-11009C43	560
R7, 8		NOT USED
R9, 10	6-11009C49	1k
R11 thru 14		NOT USED
R15, 16	6-11009C49	1k
R17, 18		NOT USED
R19, 20, 21	18-83452F19	variable; 100k
R22	6-125B70	1; 1/2 W
R23	6-11009C65	4.7k
R24	6-11009C69	6.8k
R25	6-11009C81	22k
R26	6-11009C65	4.7k
R27	6-11009C47	820
R28	6-11009C49	1k
R29	6-11009C47	820
R30	6-11009C49	1k
R31	6-11009C47	820
R32	6-11009C49	1k
R33	6-11009C47	820
R34 thru 38	6-11009C65	4.7k
R39, 40, 41	6-11009C61	3.3k
R42	6-11009C49	1k
R43	6-11009C37	330
R44	6-11009C49	1k
R45	6-11009C37	330
R46	6-11009C65	4.7k
R47, 48	6-11009C49	1k
R49, 50, 51	6-11009C73	10k
S1	40-83658N01	switch: rotary; 5 position
U1	51-84561L23	integrated circuit: (see note) timer
U2, 3	51-82884L04	quad 2-input NOR gate
U4	51-82884L17	triple 3-input NOR gate
U5, 6	51-82884L02	hex non-inverting buffer
U7	51-83629M08	quad operational amplifier

mechanical parts		
3-138162		SCREW, tapping: 4-40 × 3/8"; 6 used
42-84284B01		RETAINER; 6 used
1-80778D92		CABLE Assembly, short; 2 used TCN6264A, 3 used TCN6265A; includes: CONNECTOR, female; single contact
9-84968D01		CABLE, coaxial (WHT) 6"
30-83794C01		CABLE Assembly, long; 4 used TCN6264A, 5 used TCN6265A; includes: CONNECTOR, female; single contact
1-80778D93		CABLE, coaxial (WHT); 8-1/2"
9-84968D01		
30-83794C01		

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

MULTIFREQUENCY CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)



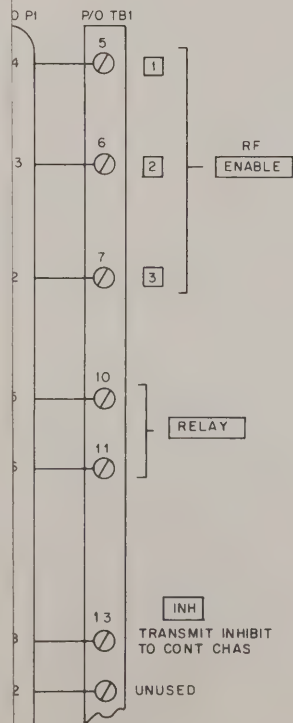
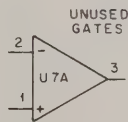
NOTES:

1. Unless otherwise specified, all resistors are in ohms; all capacitors are in microfarads; and all inductors are in microhenries.
2. J3 and J8 are installed in TCN6265A Models only.
3. DS4 flashes when S1 selects LOCAL F2 or LOCAL F3. DS4 is off when S1 selects normal F1.
4. Integrated circuit connections for this board are as follows:

Reference Designation	Mfr's Description	A +	GND
U1	Timer	8	1
U2, U3	Quad 2-Input NOR Gate	14	7
U4	Triple 3-Input NOR Gate	14	7
U5, U6	Hex Inverter Buffer	1	8
U7	Quad Op Amp	4	11

5. Jumpers are wired for either 2-frequency or 3-frequency operation as follows:

Jumper	2-Frequency	3-Frequency
JU1	OUT	OUT
JU2	IN	IN
JU3	OUT	IN



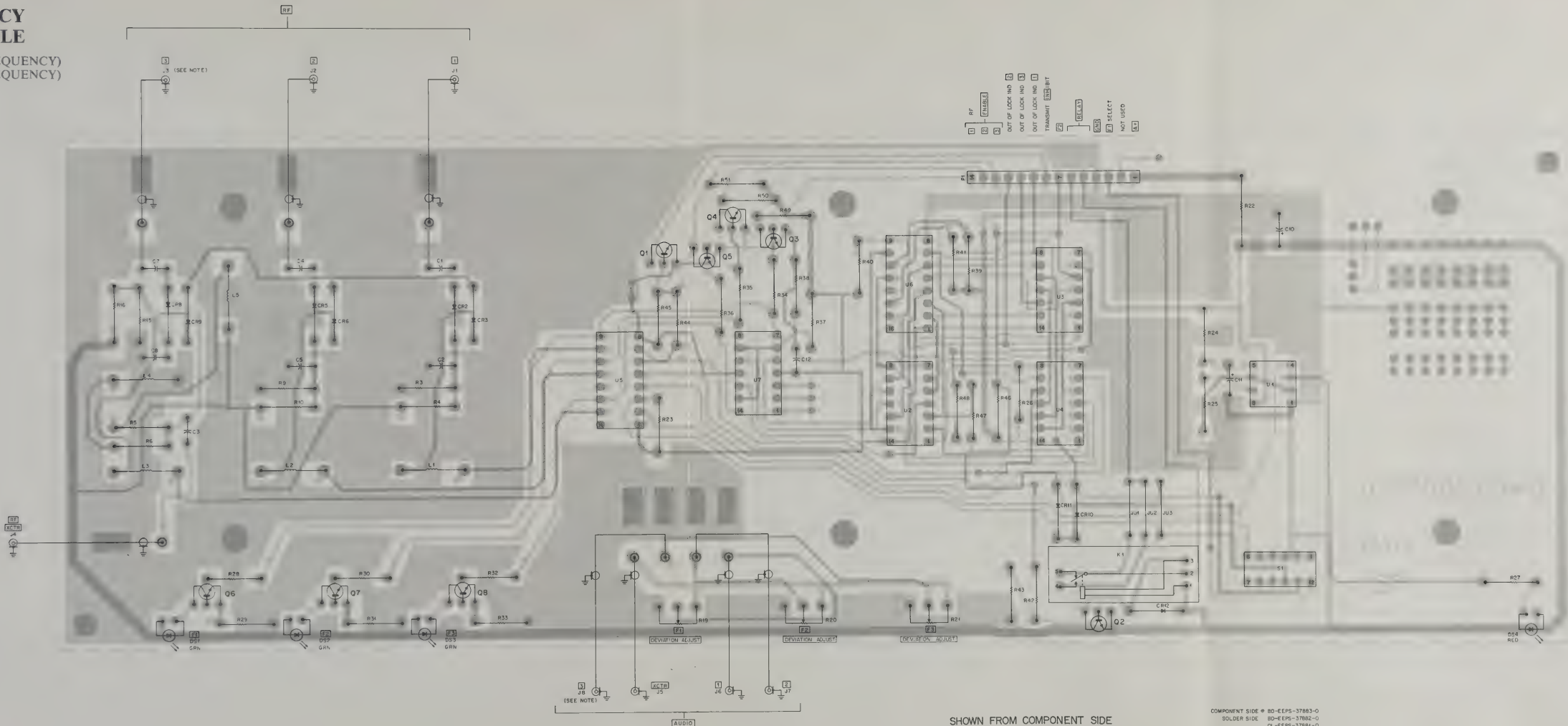
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(Sheet 3 of 3)
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MULTIFREQUENCY CONTROL MODULE

MULTIFREQUENCY
CONTROL MODULE

MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)



parts list

TCN6264A Control Board (2 Frequency)			PL-6556-O
TCN6265A Control Board (3 Frequency)			
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
C1 thru 5	21-11015A07	capacitor, fixed, uF	
C6	NOT USED	.01 + 80 - 20%,	
C7, 8	21-11015A07	NOT USED	
C9	NOT USED	.01 + 80 - 20%,	
C10	23-84538G06	47 ± 20%, 20 V	
C11	23-84538G04	15 ± 20%, 20 V	
C12	21-11015A07	.01 + 80 - 20%,	
CR1	NOT USED	diode (see note)	
CR2, 3	48-83510F03	NOT USED	
CR4	NOT USED	silicon	
CR5, 6	48-83510F03	NOT USED	
CR7	NOT USED	silicon	
CR8, 9	48-83510F03	NOT USED	
CR10, 11	48-83544H01	silicon	
CR12	48-82466H13	silicon	
D21 thru 3	48-88245C29	light emitting diode (see note)	
D24	48-88245C28	green	
J1 thru 8	29-80014A01	connector, coaxial cable	
K1	80-82617M11	relay	
L1 thru 5	24-82135G10	1 form "C", coil res. 800	
P1	28-83143M03	coil, rf	
		choke, 100 uH	
		connector, plug	
		male, 14-contact	
Q1 thru 8	48-869642	transistor (see note)	
		NPN, type M9542	
R1, 2	NOT USED	resistor, fixed ± 1/4 W	
R3, 4	6-11009C49	unless otherwise stated	
R5, 6	1k	NOT USED	
R7, 8	560	NOT USED	
R9, 10	6-11009C49	NOT USED	
R11 thru 14	1k	NOT USED	
R15, 16	6-11009C49	NOT USED	
R17, 18	NOT USED	variable, 100k	
R19, 20, 21	18-83432F19	variable, 100k	
R22	6-125B70	1, 1/2 W	
R23	6-11009C65	4.7k	
R24	6-11009C69	6.8k	
R25	6-11009C81	22k	
R26	6-11009C65	4.7k	
R27	6-11009C47	820	
R28	6-11009C49	1k	
R29	6-11009C47	820	
R30	6-11009C49	1k	
R31	6-11009C47	820	
R32	6-11009C49	1k	
R33	6-11009C47	820	
R34 thru 38	6-11009C65	4.7k	
R39, 40, 41	6-11009C61	3.3k	
R42	6-11009C49	1k	
R43	6-11009C37	330	
R44	6-11009C49	1k	
R45	6-11009C37	330	
R46	6-11009C65	4.7k	
R47, 48	6-11009C49	1k	
R49, 50, 51	6-11009C73	10k	
S1	40-83658N01	switch	
		rotary, 5 position	
U1	51-84561L23	integrated circuit (see note)	
U2, 3	51-82884L04	timer	
U4	51-82884L17	quad 2-input NOR gate	
U5, 6	51-82884L02	triple 3-input NOR gate	
U7	51-83629M08	trans non-inverting buffer	
		quad operational amplifier	

mechanical parts

3-138162
RETAINER, 8 used

4-84284B01
CABLE Assembly, short, 2 used TCN6264A,
3 used TCN6265A, includes

9-84968D01
CONNECTOR, female, 5-pin, single contact

30-83784C01
CABLE Assembly, long, 4 used TCN6264A,
5 used TCN6265A, includes

9-84968D01
CONNECTOR, female, single contact

30-83784C01
CABLE, coaxial (WHIT), 8-1/2"

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers

parts list

TKN8955A Assembly Cable (2-Frequency)			PL-8775-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
W1	1-80750D83	CABLE	
	28-83099K01	AUDIO CABLE Assembly, includes: CONNECTOR, male: single contact; 2 used	
	30-83794C01	CABLE, coaxial (WHT); 80" used	
W2	37-82603D88	SLEEVING, coded "A"; 2 used	
	1-80750D84	RF CABLE Assembly, includes: CONNECTOR, male: single contact; 2 used	
	28-83099K01	CONNECTOR, male: single contact; 2 used	
W3	30-83794C01	CABLE, coaxial (WHT); 12" used	
	37-82603D83	SLEEVING, coded "T"; 2 used	
	1-80778D97	CABLE (12") Assembly, includes: CONNECTOR, male: single contact; 2 used	
W4	30-83794C01	CABLE, coaxial (WHT); 12" used	
	1-80778D99	CABLE Assembly interconnect, includes: LUG, crimp terminal; 8 used	
	29-812979	STRAP, ltr: .091 x 3.82" (WHT); 5 used	
W5	42-10217A02	CABLE Assembly interconnect, 3-Freq., includes: LUG, crimp terminal; 4 used	
	1-80781D31	STRAP, ltr: .091 x 3.82" (WHT); 4 used	
W6	42-10217A02	CABLE Assembly, fused, includes: BODY, fuseholder	
	1-80779D01	CAP, fuseholder	
	14-82882A01	SPRING, fuseholder	
W7	41-82885A01	CLIP, fuse; 2 used	
	29-812979	STRAP, ltr: .091 x 3.82" (WHT); 4 used	
	42-10217A02	CABLE Assembly, control, includes: RECEPTACLE, crimp; 2 used	
W8	37-82603D80	SLEEVING, coded blank; 2 used	
	42-10217A02	STRAP, ltr: .091 x 3.82" (WHT); 20 used	

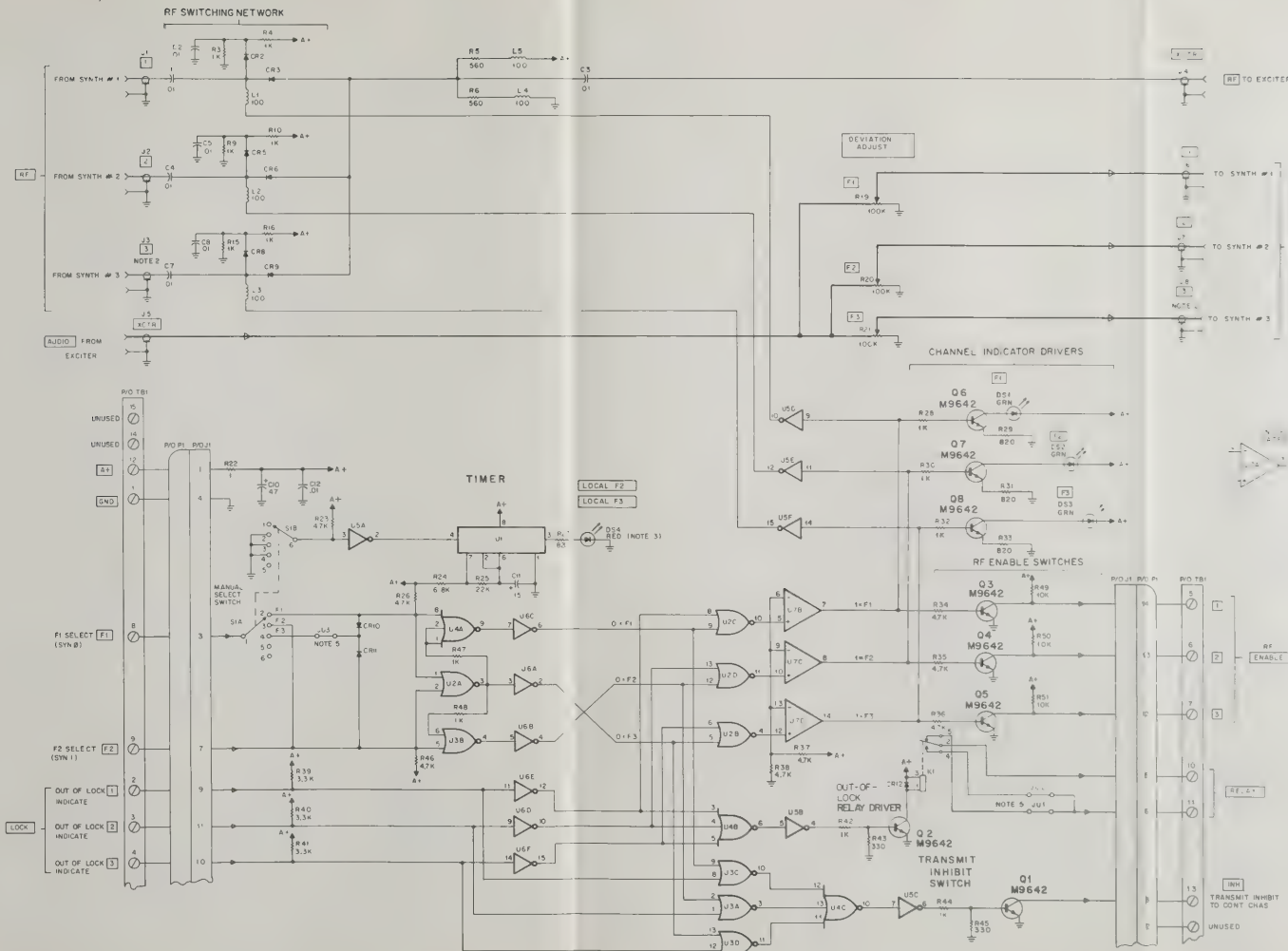
TKN8175A Hardware Kit (3-Frequency)			PL-8775-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
W1	2-82360B34	NUT, speed: 1/4-14; 6 used	
	3-135038	SCREW, tapping: 1/4-14 x 3/4"; 6 used	
	9-82578B01	CONNECTOR "T"	
W2	47-82977P01	ROD, slide synthesizer; 2 used	
	54-83261P01	LABEL, channel and frequency	

TKN8214A Modem Cable			PL-8775-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
W1	1-80781D30	MODEM CABLE Assembly 60" (TKN8988A) includes: HOOD, connector	
	14-84502E01	CONNECTOR, male; 25 contact	
	28-84506E01	LUG, crimp terminal; 4 used	
W2	37-82603D88	SLEEVING, coded "A"; 2 used	
	42-10217A02	STRAP, ltr: .091 x 3.82" (WHT); 11 used	
W3	1-80742D35	MODEM CABLE Assembly (TKN8214A) includes: HOOD, connector	
	14-84502E01	CONNECTOR, male; 25 contact	
	28-84506E01	LUG, crimp terminal; 4 used	
W4	29-812979	STRAP, ltr: .091 x 3.82" (WHT); 10 used	
	29-84078B01	LUG, flanged spade	
	42-10217A02	STRAP, ltr: .091 x 3.82" (WHT); 10 used	

TKN5980A Hardware Multifrequency			PL-8777-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
W1	3-136162	SCREW, tapping: 4-40 x 3/8"; 2 used	
	42-84284B01	RETAINER; 2 used	
	75-82303N04	PAD, rubber	
W2	5-84500B03	EYELET, special; 2 used	
	15-83337N02	COVER, channel element	
	1-80768B04	EXCITER CABLE Assembly includes: SOCKET	
W3	9-83208C02	CONNECTOR, female: single contact (BNC); 2 used	
	26-82254P01	SHIELD, oscillator	
W4	30-83794C01	CABLE, coaxial (WHT); 18" used	
	37-109120	GROMMET, rubber	
W5	37-82603D88	SLEEVING, coded "A"	
	37-82603D83	SLEEVING, coded "T"	
W6	2-82360B34	NUT, speed: 1/4-14"; 18 used	
	3-135038	SCREW, tapping: 1/4-14 x 3/4"; 18 used	
W7	7-84172N02	BRACKET, rack	
	9-82578B01	CONNECTOR, "T"	
W8	42-10217A10	STRAP, ltr: 0.124 x 7.78"; 4 used	
	47-82977P01	ROD, slide synthesizer; 2 used	
	54-83261P01	LABEL, channel and frequency	

TKN9039A Chassis Hardware (2-Frequency)			PL-8689-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
W1	3-129957	SCREW, machine: 4-40 x 5/16"; 3 used	
	3-136850	SCREW, tapping: 6-32 x 1/2"; 4 used	
	27-82978P01	CHASSIS	
W2	38-83856P01	KNOB, control	
	42-84284P01	RETAINER; 3 used	
	15-82979P01	COVER	
W3	38-010388	BUTTON, plug; 2 used (TRN9039A only)	

TKN8989A Cable Barrier Strip			PL-8690-O
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
P1	15-83142M03	connector, receptacle: HOUSING, 14-contact	
	31-824738	terminal board: 15 terminals	
	39-82717M01	CONTACT, receptacle; 13 used	
TB1	42-10217A02	STRAP, ltr: .091 x 3.82" (WHT); 6 used	



MULTIFREQUENCY
CONTROL MODULE
MODELS TLN2675A (2 FREQUENCY)
TLN2703A (3 FREQUENCY)

- NOTES:
- Unless otherwise specified, all resistors are 1/4 watt, 5% tolerance and all capacitors are .01 microfarad, 50V.
 - J3 and J8 are installed in TON6255A Mainframe.
 - D54 flashes when S1 selects LOCAL F2 or LOCAL F3, and flashes normal F1.
 - Integrated circuit connections for this board are as follows:
- | Reference Designation | Mfg's Description | A+ | GND |
|-----------------------|-------------------------|----|-----|
| U1 | Timer | E | |
| J2 U3 | Quad 2-input NOR gates | 14 | 7 |
| U4 | Triple 3-input NOR gate | 14 | |
| U5 U6 | Hex inverter | 1 | E |
| U7 | Quad Op Amp | 4 | |
5. Jumpers are wired for either 2 frequency or 3 frequency operation as follows:
- | Jumpers | 2-Frequency | 3-Frequency |
|---------|-------------|-------------|
| JU1 | OUT | OUT |
| JU2 | IN | IN |
| JU3 | OUT | IN |

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUALS AFFECTED:

68P81061E95-0	<i>PURC</i> Radio Link Transmitter Instruction Manual
68P81060E70-A	<i>PURC</i> Radio Paging Station Instruction Manual

REVISION DETAILS:

The attached TRN5348B Transmitter Flat Audio Board page, PEPS-34631-A, replaces the following:

PEPS-35313-0	in 68P81061E95-0
PEPS-34631-0	in 68P81060E70-A

ATTACHMENT:

TRN5348B Transmitter Flat Audio Board Circuit Board
Detail, Schematic Diagram, and Parts List.....PEPS-34631-A

A	DESCRIPTION
	<p>capacitor, fixed: uF \pm 20%; 20 V; unless otherwise stated</p> <p>4.7 .001 \pm 10%; 100 V 100 pF .068 \pm 5%; 100 V .043 \pm 5%; 50 V 4.7 10 \pm 10%; 15 V 4.7 .0326 \pm 2%; 50 V .0056 \pm 2%; 50 V .0045 \pm 1%; 50 V 4.7 10 \pm 10%; 15 V 4.7 .001 \pm 10%; 100 V 4.7 220 .01</p> <p>transistor: (see note) NPN; type M9642</p> <p>resistor, fixed: \pm 5%; 1/4 W; unless otherwise stated</p> <p>56k 22k 1.8k 3.9k 120k 68k 6.8k 1k 4.7k 5.6k 1k 6.8k 3.9k 120k 68k 6.8k 470 1k 4.7k 22k 10k 4.7k 1.2k 6.8k 100 18k</p> <p>integrated circuit: (see note) IDC hybrid</p>

on-referenced parts
RECEPTACLE, circuit board mount; 11 used JUMPER, plug-in; 2 used RECEPTACLE

resistors, capacitors, diodes, transistors, and integrated circuits must be identified by their part numbers.

instruction manual revision

SUPERSEDES SMR-4605

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A	PURC Radio Paging Stations Control and Application
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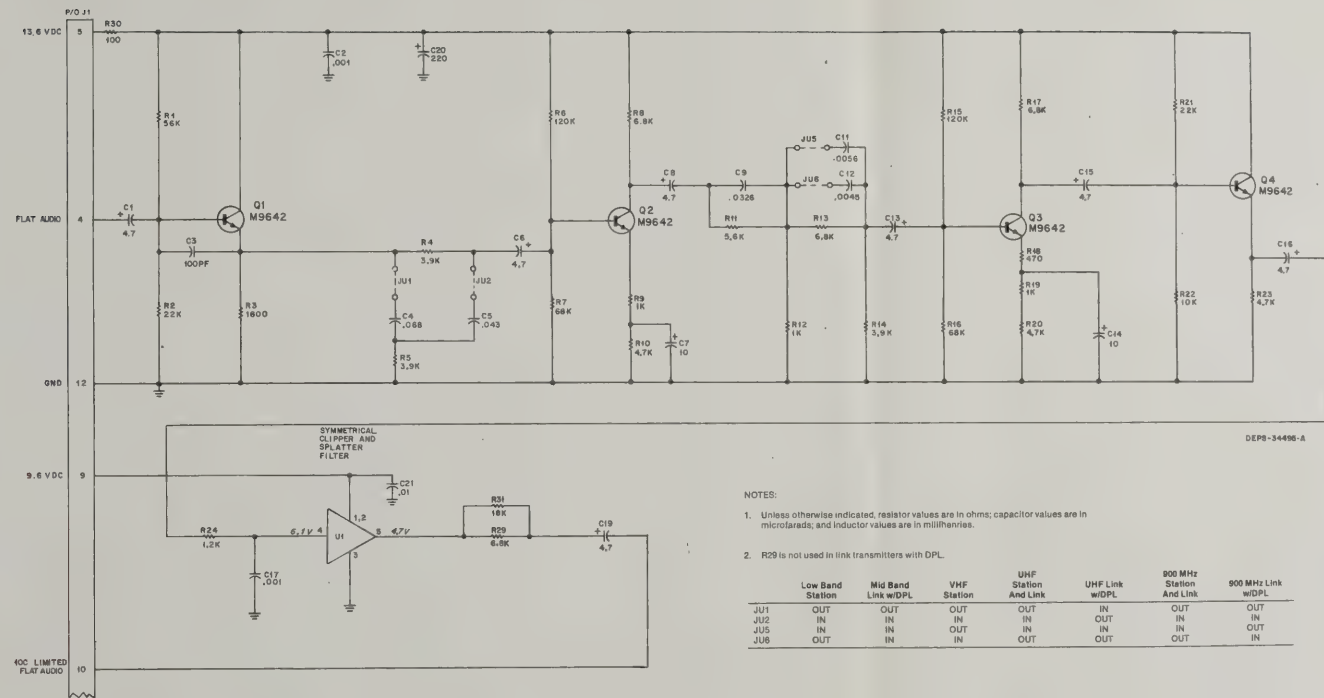
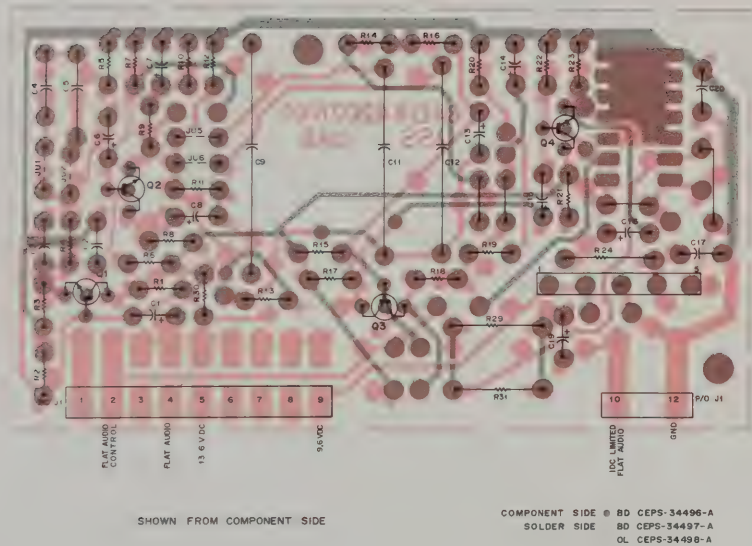
REVISION DETAILS:

1. This revision includes information regarding the following paging synthesizer models:

-- TLD2592A	132-150 MHz
-- TLE2271A	406-420 MHz
-- TLF1342A	928-960 MHz

In addition, a revised instruction section for the PURC Simulcast Control Module is also provided. Replace the existing instruction sections in your manual with the attached, revised instruction sections.

2. ATTACHMENTS
Paging Synthesizer Instruction Section.....68P81062E72-C
Simulcast Control Module Instruction Section...68P81063E73-B



parts list

TRN5348A Transmitter Flat Audio Board PL-7975-A

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		capacitor, fixed: uF ± 20%; 20 V; unless otherwise stated
C1	23-84538G02	4.7
C2	21-11015B13	.001 ± 10%, 100 V
C3	21-11014H48	100 pF
C4	8-84637L48	.068 ± 5%, 100 V
C5	8-83813H14	.043 ± 5%, 50 V
C6	23-84538G02	4.7
C7	23-11013C07	10 ± 10%, 15 V
C8	23-84538G02	4.7
C9	8-84326A25	.0326 ± 2%, 50 V
C11	8-84326A13	.0056 ± 2%, 50 V
C12	8-84326A30	.0045 ± 1%, 50 V
C13	23-84538G02	4.7
C14	23-11013C07	10 ± 10%, 15 V
C15, 16	23-84538G02	4.7
C17	21-11015B13	.001 ± 10%, 100 V
C18	23-84538G02	4.7
C20	23-84665F06	220
C21	8-11017B06	.01
Q1, 2, 3, 4	48-869642	transistor (see note) NPN, type M9642
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R1	6-11009E91	56k
R2	6-11009E81	22k
R3	6-11009E55	1.8k
R4, 5	6-11009E63	3.9k
R6	6-11009E99	120k
R7	6-11009E93	68k
R8	6-11009E69	6.8k
R9	6-11009E49	1k
R10	6-11009E65	4.7k
R11	6-11009E67	5.6k
R12	6-11009E49	1k
R13	6-11009E69	6.8k
R14	6-11009E63	3.9k
R15	6-11009E99	120k
R16	6-11009E93	68k
R17	6-11009E69	6.8k
R18	6-11009E41	470
R19	6-11009E49	1k
R20	6-11009E65	4.7k
R21	6-11009E61	22k
R22	6-11009E73	10k
R23	6-11009E65	4.7k
R24	6-11009C81	1.2k
R29	6-11009C69	6.8k
R30	6-11009E25	100
R31	6-11009C79	18k
U1	1-8075D60	integrated circuit (see note) IDC hybrid
		non-referenced parts
	9-83697M01	RECEPTACLE, circuit board mount, 11 used
	9-84728L01	JUMPER, plug-in, 2 used
	28-54729L01	RECEPTACLE

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers



MOTOROLA INC.

instruction manual revision

SUPERSEDES SMR-4605

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81060E70-A	PURC Radio Paging Stations Control and Application
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REVISION DETAILS:

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2. ATTACHMENTS
Paging Synthesizer Instruction Section.....68P81062E72-C
Simulcast Control Module Instruction Section...68P81063E73-B

**MOTOROLA INC.**Communications
Sector**PAGING SYNTHESIZER**

MODELS: TLB1572A, TLB1562A 30-36 MHz
 TLB1573A, TLB1563A 36-42 MHz
 TLB1574A, TLB1564A 42-50 MHz
 TLD2592A 132-150 MHz
 TLD2593A 150-174 MHz
 TLE2271A 406-420 MHz
 TLE2273A 450-512 MHz
 TLF1352A, TLF1342A 928-960 MHz

PERFORMANCE SPECIFICATIONS

Frequency Stability With HSO (High Stability Osc) Without HSO	Same as HSO ($\pm .02$ ppm) ± 2 ppm -30 to -60°C
Supply Voltage Requirements	$+13.8$ V dc $\pm 20\%$
Supply Current Drain	800 mA, maximum
Spurious and Harmonic Emissions	More than 85 dB below carrier (or station spec)
FM Noise With EIA Pre-emphasis With Flat Audio	55 dB 40 dB
Audio Response	± 0.5 dB; 300 Hz to 3 kHz
Audio Harmonic Distortion	Less than 1% at ± 3 kHz
Audio Sensitivity Low Band Other Bands	3 V to 4 V p-p for ± 5 kHz at 1 kHz 2 V to 3 V p-p for ± 5 kHz at 1 kHz
DC Deviation Range at F_c	± 3 kHz to ± 5 kHz
Data Deviation Range at F_c	± 3 kHz to ± 5 kHz
Data/Voice Mode Transient	Less than 100 Hz peak
Data Rise Fall Time	Less than 160 μsec
RF Output	0.3 V rms to 1 V rms
Frequency Ranges: Low Band 30-50 MHz High Band 132-174 MHz UHF 406-420 MHz UHF 450-512 MHz 900 MHz 928-960 MHz	10.0 to 16.666 MHz 11.0 to 14.5 MHz 11.277 to 11.666 MHz 12.5 to 14.222 MHz 12.888 to 13.333 MHz

PAGING SYNTHESIZER INTERFACE REQUIREMENTS

HSO Supply Voltage	24 V dc $\pm 10\%$
HSO Power Consumption	11 watts, max.
Synthesizer Supply Voltage	13.8 V dc $\pm 20\%$
Synthesizer Current Drain	800 mA dc
HSO RF Level	More than 1.0 V rms @ 50 ohms
Synthesizer RF Output Level	More than 0.3 V rms into cable terminated by exciter
Audio Input Level	More than 4 V peak to peak @ 1 kHz
Data Levels	"1" — More than 4 V "0" — Less than 0.7 V
Data Enable Levels	Enable — More than 7 V Disable — Less than 0.7 V
RF Enable Input	Enable — Less than 0.7 V ($I_{\text{Source}} = 4$ mA) Disable — More than 9 V
Out of Lock Indicate	I_{sink} less than 4 mA dc
Synthesizer Metering	TEK-5 or equivalent

technical writing services

9/15/83 - V&G

1301 E. Algonquin Road, Schaumburg, IL 60196

68P81062E72-C

PAGING SYNTHESIZER

CODE:

MODEL		FREQ. RANGE
TLB1572A	30-36 MHz (DELETE HSO)	
TLB1573A	36-42 MHz (DELETE HSO)	
TLB1574A	42-50 MHz (DELETE HSO)	
TLE2273A	450-512 MHz	
TLD2593A	150.8-174 MHz	
TLB1564A	42-50 MHz	
TLB1563A	36-42 MHz	
TLB1562A	30-36 MHz	
TLE2271A	408-420 MHz	
TLD2592A	132-150 MHz	
TLF1342A	928-960 MHz	
TLF1352A	928-960 MHz (MULTIFREQUENCY)	

PAGING SYNTHESIZER

MODEL CHART

CODE:

● = ONE ITEM SUPPLIED

ITEM	DESCRIPTION
TRN5058A	REGULATOR BOARD
TKN8968A	SYNTHESIZER CABLE
TKN8967A	HSO CABLE
TKN8966A	REFERENCE CABLE
TRN5447A	SYNTHESIZER HARDWARE
TLB8502A	SYNTHESIZER BOARD 30-36 MHz
TLB8503A	SYNTHESIZER BOARD 36-42 MHz
TLB8504A	SYNTHESIZER BOARD 42-50 MHz
TLD9333A	SYNTHESIZER BOARD 150.8-174 MHz
TLE5493A	SYNTHESIZER BOARD 450-512 MHz
TLE5491A	SYNTHESIZER BOARD 406-420 MHz
TLF6582A	SYNTHESIZER BOARD 928-960 MHz
TLD9332A	SYNTHESIZER BOARD 132-150 MHz
TRN5672A	SYNTHESIZER HARDWARE
TRN5960A	SYNTHESIZER HARDWARE (DELETE HSO)
TRN9035A	SYNTHESIZER HARDWARE (MULTIFREQUENCY)

EPS-34980-B

1. GENERAL DESCRIPTION

The paging synthesizer is a standard 19" rack mounted unit designed for use in Motorola *Micor* Paging Base Stations. The paging synthesizer provides a modulated rf signal to drive the exciter. Modulation can be either analog (voice and tones) or digital (binary paging codes or equivalent). Digital modulation including dc is made possible by the technique of dual-port modulation, where dc and low frequency data components are controlled by the digital modulation circuit. The higher frequency components of modulation (greater than 1 Hz) are accommodated by direct frequency modulation (fm) of the synthesizer voltage controlled crystal oscillator (VCXO or channel element). The paging synthesizer also provides high frequency stability by optional phase-locking to 100 kHz, 1 MHz, 5 MHz (standard) or 10 MHz high stability reference oscillators. Refer to the voltage regulator board and paging synthesizer schematic and block diagrams for the following descriptions. Figures 1 and 2 show component location and the solder side shield location.

2. FUNCTIONAL BLOCK DESCRIPTIONS

2.1 9.6 V AND 5 V REGULATORS

(Refer to PEPS-34965 for details)

2.1.1 The 9.6 V regulator consists of a series pass transistor (Q400) which is driven by the regulator integrated circuit (U400). The regulated 9.6 V dc is provided to all analog and rf circuits, and is derived from the station 12 V dc supply (typically 13.6 V dc).

2.1.2 The 5 V regulator is supplied from the regulated 9.6 V dc supply, and provides regulated 5 V dc to all logic circuits requiring 5 V dc. The 5 V regulator consists of a 3-terminal integrated circuit (U401).

2.2 REFERENCE AMPLIFIER AND SWITCH (Q24, Q23)

(Refer to Paging Synthesizer diagrams PEPS-34989 for details)

The reference amplifier and switch amplify the high stability oscillator signal to the proper logic levels and shape, for application to integrated circuits U14 and U16.

2.3 REFERENCE DIVIDER (U14, U15, U16)

The reference divider divides the High Stability Oscillator (HSO) frequency down to 100 kHz for use in phase locking U18, the 14.4 MHz oscillator. HSO frequencies of 100 kHz, 1 MHz, 5 MHz, or 10 MHz can be programmed by jumpers JU20 and JU21.

2.4 REFERENCE PHASE DETECTOR (U17)

One section of U17, (quad exclusive-OR gate) is used as a reference phase detector. The output consists

of pulses at 200 kHz, (twice the input frequency) having a width dependent on the phase error between the two input signals to U17.

2.5 REFERENCE LOOP FILTER

(Q22 with associated circuitry)

Q22 amplifies the output pulses of U17 to approximately 8 volts peak-to-peak. R61, C62, R60, and C61 form an integrator circuit which recovers the dc value of Q22 output pulses, for use in controlling the frequency of U18 (14.4 MHz voltage controlled crystal oscillator, VCXO).

2.6 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (U18)

U18 is a 14.4 MHz voltage controlled crystal oscillator which is phase-locked to the HSO. The output of U18 is used to provide one of the phase detector (U17) inputs, and also provide an input to the digital modulator circuitry (U11).

2.7 REFERENCE LOOP AMPLIFIER

(Q21, Q20, Q19)

The reference loop amplifier amplifies U18 output signal to the proper logic levels and shape for application to U19 (reference loop divider) and U11 (digital modulator).

2.8 REFERENCE LOOP DIVIDER (U19, U20)

Reference loop dividers U19 and U20 divide the output frequency of Q19 by 144. This is the 100 kHz feedback signal to the phase detector (U17), which is compared in phase to the 100 kHz signal derived from the HSO.

2.9 DIGITAL MODULATOR (U9, U10, U11, U12, U13)

2.9.1 This circuit frequency modulates the output signal of Q19 to the "one" and "zero" frequencies upon command of the pulse insertion oscillator dividers U3 through U8.

2.9.2 Pulse insertion results in positive deviation by inserting extra pulses into the 14.4 MHz pulse train at the appropriate rate. This takes place in integrated circuit U12 (exclusive-OR gate with the input on pins 4 and 5; output on pin 6).

2.9.3 Pulse blanking, similarly, creates negative deviation by blanking pulses from the 14.4 MHz pulse train at the appropriate rate. This occurs in integrated circuit U11 (input pins 12 and 13, output pin 11).

2.9.4 Pulse insertion is selected upon command by a data enable and a data "one". Pulse blanking is

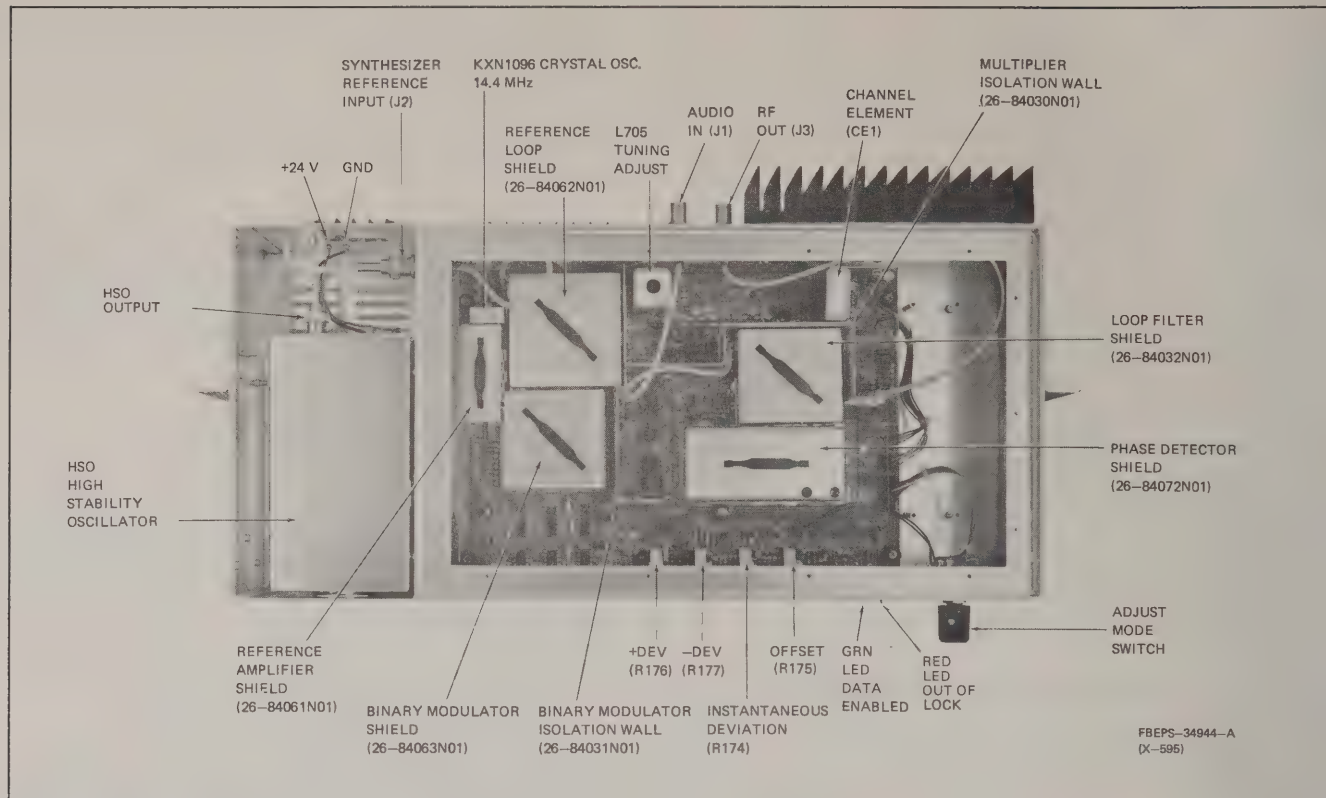


Figure 1. Paging Synthesizer Component Location

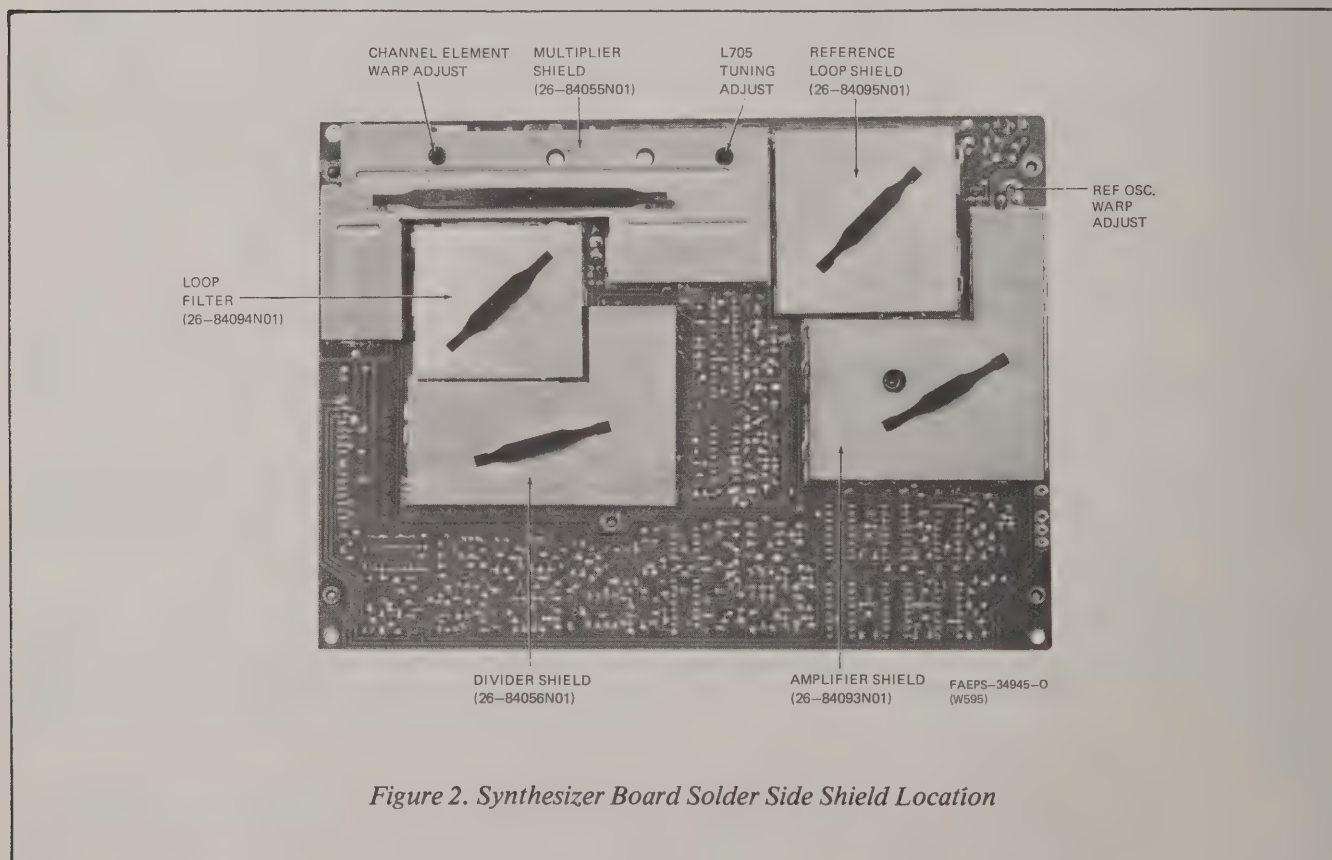


Figure 2. Synthesizer Board Solder Side Shield Location

selected upon command by a data enable and a data “zero”. The appropriate rate of insertion pulses or blanking pulses is determined by the following formula:

$$R = \frac{\text{Deviation} \times 14.4 \text{ MHz}}{\text{Carrier Frequency (MHz)}}$$

The frequency modulated 14.4 MHz is divided by two to 7.2 MHz, by U13 (input pin 11, output pin 9) and serves as the reference input for the main synthesizer loop phase detector U602.

2.10 PULSE INSERTION OSCILLATORS AND DIVIDERS (U1 and U3-U8)

U1 is a dual timer which serves as two independent RC oscillators. The outputs are frequency divided by U3 through U8 to obtain the pulse insertion and blanking rates mentioned in paragraph 2.9. These are necessary for (+) and (–) data deviation of the 14.4 MHz signal. R176 and R177 are precision potentiometers for setting the “one” and “zero” (or + and –) deviations respectively. In order to obtain the proper deviations, jumpers JU1 through JU18 which set the divider ratios, must be properly installed.

2.11 MAIN LOOP DIVIDER (U602), ROM (U604)

2.11.1 U602 is an integrated circuit which is used to divide the 7.2 MHz reference input (pin 2) to either 2.0833 kHz or 2.500 kHz output (pin 5) depending on the frequency band (900 MHz, UHF, or HB, LB respectively). The internal $\div 63/\div 64$ prescaler is driven by U601 and in turn drives the A and B dividers internally. The choice of 2.0833 kHz, or 2.500 kHz, and the numbers programmed into the A and B dividers are stored in U604 and called out on “D” lines (U604-12,11,10,9) by U602 addressing the “A” lines (U604-5,6,7).

2.11.2 The A and B dividers provide the loop output at 2.0833 kHz or 2.500 kHz (U602-9). This frequency is derived from the channel element (CE1). U602 pin 9 is also used to signal the $\div 3/\div 4$ prescaler (U601) when to divide by 4 rather than 3. The $\overline{C0}$ and $\overline{C1}$ lines (pins 15 and 16) signal to U601 how many times to divide by 4 rather than 3. This information is stored in U604 ROM and (like A and B divider programs) differs from channel to channel.

2.12 SAMPLE AND HOLD PHASE DETECTOR (U603)

Integrated circuit U603 is used to compare the two divider IC output phases (2.0833 kHz or 2.500 kHz depending on the frequency band). It ultimately generates an output signal on pin 15, which after further filtering and amplification, is used to control the frequency of the channel element (CE1).

2.13 LOOP DC AMPLIFIERS (U609, U21) LOOP FILTERS, AND LOOP SUMMERS (U21)

2.13.1 DC amplifier U609 amplifies the output signal of U603 and applies this signal to the loop filter.

2.13.2 The loop filter is composed of R122, R123, C23, C24, and C28. It is a standard lead-lag filter and results in a loop bandwidth of about 1/2 Hz, with a damping factor of approximately 0.65. These parameters determine that the cross-over frequency between pulse insertion/blanking modulation, and the modulation summed in this loop is approximately 1 Hz.

2.13.3 The first loop summer (U21-8,9,10) adds binary modulation to the loop dc control voltage and amplifies the data amplitude by a factor of 2. Following the first loop summer is a 3 kHz passive RC low pass filter (R79, R78, R77, C74, C75, and C76), which has no effect on the dc control voltage, but shapes the data modulation to prevent excessive modulation sideband splatter. This filter is buffered by unity gain amplifier Q25, Q26.

2.13.4 U21 pins 2 and 3 is the second loop summer which is used to sum voice or tone modulation with the loop dc control voltage. For modulation, it has a voltage gain of unity; for the loop signals, it has a voltage gain of two. The output (pin 1) is applied directly to the channel element (CE1) modulation port (pin 4). This controls the channel element frequency so that it is phase locked to the 7.2 MHz output of the digital modulator circuit, and also directly frequency modulates it with voice or tones, or splatter filtered data.

2.14 CHANNEL ELEMENT (CE1)

The channel element serves as the voltage controlled crystal oscillator (VCXO) in the main synthesizer loop, and provides an output signal between 10 and 16-2/3 MHz. The output signal is amplified and drives the exciter in the transmitter portion of the base station.

2.15 EXCITER AMPLIFIER/BUFFER SWITCH (Q701, Q36, Q37, CR1, CR2)

Q701 (not used on 900 MHz model) amplifies the output of channel element (CE1) to the proper level to drive a base station exciter. Q36 and Q37 buffer the output of Q701 to prevent loading by the coaxial cable used to connect it to the base station exciter. CR1 and CR2 PIN diodes used in a series-shunt rf switch greatly attenuate the signal delivered to the base station exciter, if rf enable is a high level dc signal. The output of the synthesizer (Q36 and Q37 emitters) is frequency multiplied in the base station, just as a normal channel element signal would be: $\times 3$ for low band, $\times 12$ for high band, $\times 36$ for UHF, and $\times 72$ for 900 MHz.

2.16 FREQUENCY MULTIPLIERS (Q706, Q702, Q703, Q704) AND BUFFER (Q40)

2.16.1 For low band models, Q702 and Q703 are not used. Q706 is a unity gain amplifier, and Q704 and associated components form a frequency tripler. The output of Q704 is limited in amplitude by CR6 and CR7, buffered by Q40 before being applied to U601 pin 1 (divide by 3/divide by 4 prescaler).

2.16.2 For all other models, Q706 is a unity gain buffer, Q702 is a frequency tripler, and Q703 and Q704 are both frequency doubling stages. The overall frequency multiplication is a factor of 12. CR6, CR7, and Q40 are as described before. Low band and the other frequency bands differ so that the phase detector input frequencies may remain reasonably high and still achieve the desired channel spacings.

2.17 $\div 3/\div 4$ PRESCALER (U601)

2.17.1 U601 is normally used to allow synthesizer operation from a 400 MHz or higher voltage controlled oscillator. In this synthesizer the highest frequency from Q40 is 174 MHz. U601 used in this application with frequency multipliers, allows all of the desired channel spacings to be achieved without resorting to excessively low phase detector (U603) input frequencies.

2.17.2 $\overline{C0}$ and $\overline{C1}$ (U601 pins 7 and 6) receive instructions from U604 via U602 as to how many cycles of its operation U601 should be in the divide by 4 mode during a loop pulse period (loop pulse is signaled from U602 pin 9 to U601 pin 5). In this manner an assortment of non-integer divisors are achieved. The total frequency divisor from CE1 pin 3 to U602 pin 9 is:

$$\text{Low Band: } N_T = \frac{3(64A + 63B) + C}{3}$$

$$\text{Other Bands: } N_T = \frac{3(64A + 63B) + C}{12}$$

(where A and B are U603 divider programs, and C is the U601 program).

2.18 LOSS OF LOCK DETECTOR (U606, U607)

The loss of lock detector consists of two voltage comparators (both within U606); a reference loop detector and a main loop detector. The outputs of these are combined in U607, a quad OR-gate. The output of U607 is dc amplified by Q39, stored in delay capacitor C93, and used to inhibit transmitter keying by Q33 in the event of loss of lock. The delay time constant components C93, and R164, are used to prevent false transmission during acquisition of lock or other transient or oscillatory conditions. Q32 drives DS1 which provides a visual indication for out of lock condition.

2.19 DATA MODULATOR (Q3-5, Q9-14, Q31, Q42, Q43, U22)

2.19.1 The data modulator performs two functions:

First, it translates data levels to precisely the peak-to-peak voltage level necessary for modulation of the main synthesizer loop via U21 pin 10. This is adjustable with R174. Secondly, it provides a dc level which is superimposed on the data applied to U21 pin 10. This level is adjustable (in the data enable mode) by R175. This dc level is necessary for the following conditions:

- To change the data levels, so they are symmetrical about the main loop dc control voltage for equal plus and minus frequency deviations.
- To change the data levels so they are not symmetrical about the main loop dc control voltage for unequal plus and minus frequency deviations, if desired.

Q3,4,9,13, and 14 perform the first function by switching R174 to either a fixed high level voltage (data "1") or a fixed low level voltage (data "0"). R174 is switched by either Q13 or Q14, but not both simultaneously. The resistance setting of R174 along with fixed resistors R137 and R134 determine the voltage amplification of op. amp. U22 for the data levels.

2.19.2 The circuit composed of Q5, Q31, Q42, and Q43 connects R175 into the circuit in the data enable mode. Switching transistors Q42 and Q43 are both on at the same time thus connecting R175 between regulated 9.6 V dc and ground. The voltage setting of R175 provides the adjustable dc level function mentioned above in the data enable mode. This voltage is summed with the data in op. amp. U22, via R133 and along with R134, provides unity gain for this level. DS2 provides a visual indication of the Data Enable mode.

2.20 DATA SIMULATOR (U23)

2.20.1 This circuit provides a simulated 300 bps data stream which, when selected by the rotary switch S1 (INSTANTANEOUS DEVIATION ADJUST position) on the synthesizer panel allows the peak-to-peak data deviation to be set using R174.

2.20.2 In the OFFSET ADJUST mode of rotary switch S1, a simulated data stream and a pulsating data enable are available. This allows for convenient setting of the data bias control R175, by adjusting for minimum frequency transient upon change of data enable states (voice/tone to data, and vice versa). Final adjustment of R174 and R175 cannot be made until the +DEV (R176) and -DEV (R177) controls are set. The rotary switch must always be returned to the normal (OPERATE) position after servicing the station. An ADJUST MODE LED (DS3) is provided to indicate if the switch is not in the OPERATE mode.

2.20.3 U23 is a self contained RC oscillator and frequency divider. Oscillation of U23 is controlled by R139, R140, and C81. The frequency of oscillation determines the rate of the simulated data stream. Q34 buffers the simulated data for application to the binary modulator through the rotary switch when selected. U23 further frequency divides the oscillation frequency to provide a simulated pulsating data enable signal of approximately 1.5 Hz. This circuit is included as an aid to servicing and alignment, and is not normally activated during system operation.

3. SUMMARY

The paging synthesizer allows analog or digital (binary) modulation of paging base stations including low band, high band, and UHF. It not only provides dc modulation capability, but high stability transmitter frequency at the same time; this is necessary for simulcast system applications.

4. ALIGNMENT PROCEDURE

4.1 GENERAL

4.1.1 Monitor the transmitter output frequency with an adequate frequency counter (typically accurate to ± 1 Hz). The transmitter modulation should be monitored with a Motorola Service Monitor (R1200) with a deviation meter or equivalent.

4.1.2 On later model synthesizers:

- TP1 can be measured at TB1 "test points" when S1 is in ON position.
- TP2 can be measured at TB2 "test points" when S1 is in OPERATE position.

4.2 MULTIPLIER

(Use a Motorola TEK-5 or equivalent metering panel.)

Step 1. Low Band — Peak L705 on Meter 3.

Step 1A. Other Bands —

- Peak L703 on Meter 1
- Peak L704 on Meter 2
- Peak L705 on Meter 3

Step 2. Repeat Step 1A.

4.3 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (VCXO)

Adjust U18 warp coil (located through small hole on top of chassis, (see Figure 3) for $1.5 \text{ V} \pm 0.1 \text{ V}$ dc at test point 1 (junction of C82 and R150). A high resistance voltmeter (11 megohm, R1002 or equivalent) must be used.

4.4 CHANNEL ELEMENT (CE1)

Step 1. Set the adjust mode switch on the synthesizer to the OPERATE mode. **DO NOT** apply any modulating signals.

Step 2. Set CE1 warp capacitor for $4.7 \text{ V} \pm 0.3 \text{ V}$ dc at test point 2 (junction of R151 and C83). Use a high resistance voltmeter as before. Refer to Figure 3 for location of tuning hole.

4.5 HIGH STABILITY OSCILLATOR (HSO)

The high stability oscillator (Y1) should be allowed to warm up for at least 30 minutes before proceeding any further. This is necessary for the oven in the oscillator to reach its operating temperature.

Step 1. Key the transmitter.

Step 2. Adjust the HSO to the assigned transmitter output frequency ± 10 Hz.

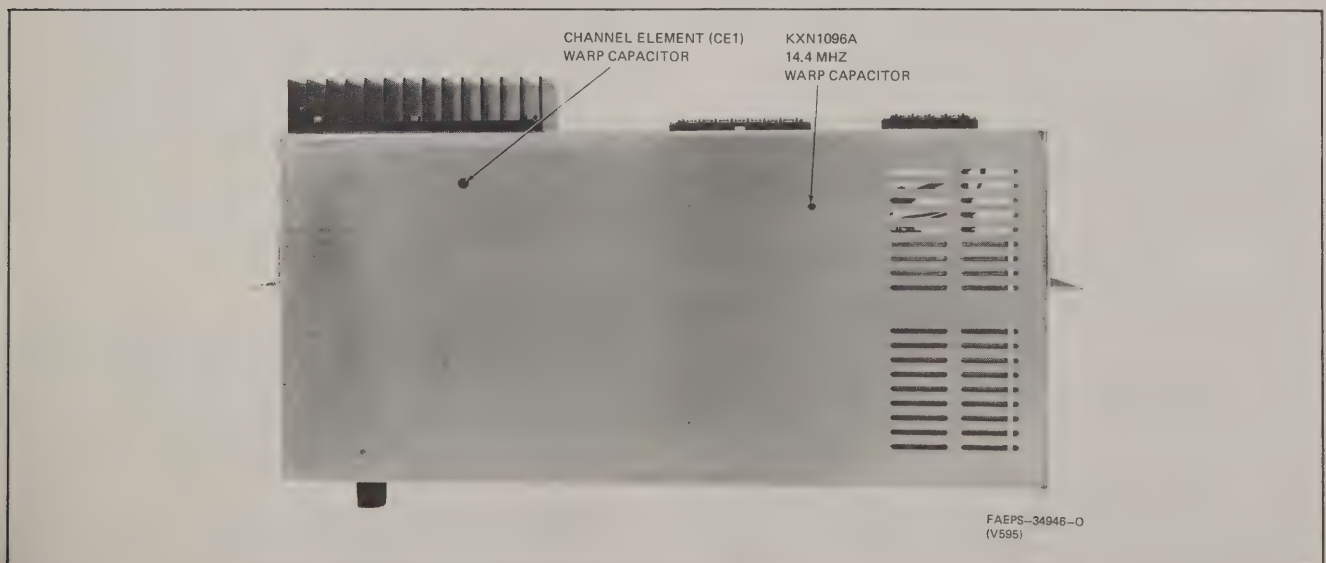


Figure 3. Synthesizer Tuning Adjustment Location

Step 3. Repeat paragraphs 4.3 and 4.4.

4.6 DIGITAL MODULATOR (+ DEV and – DEV) (Refer to paragraph 4.10 before performing this procedure.)

Step 1. Set the panel switch on the synthesizer to the OPERATE position.

Step 2. Set the switch on the TSI module to the TEST position. The TSI module is located in the station control chassis.

Step 3. Pulse Insertion: Select the + DEVIATION position of the switch on the TSI module. Set R176 (+ DEV) on the synthesizer panel for the transmitter output frequency of $F_T + 4.000$ kHz.

Step 4. Pulse Blanking: Select the – DEVIATION position of the switch on the TSI module. Set R177 (– DEV) on the synthesizer panel for transmitter output frequency of $F_T - 4.000$ kHz.

Step 5. Return the TEST switch on the TSI module to the normal position.

4.7 INSTANTANEOUS DEVIATION ADJUST (R174)

Step 1. Set the panel switch on the synthesizer to the INSTANTANEOUS DEVIATION ADJUST mode. The adjust mode and data enable lamps should light. The transmitter is now modulated with simulated data.

Step 2. Set R174 on the synthesizer panel for ± 4.0 kHz deviation.

4.8 OFFSET (R175)

Step 1. Disconnect the out-of-lock (transmitter inhibit) line to the station.

Step 2. Set the panel switch on the synthesizer to the OFFSET ADJUST position. The adjust mode lamp should be lit, and the data enable lamp should be pulsating slowly.

Step 3. Set R175 on the synthesizer for minimum transient or bounce on the transitions from no modulation to data modulation or vice-versa.

Step 4. Re-connect the out-of-lock line to the station. The station should remain keyed. The out-of-lock lamp should not be lit.

Step 5. Return the panel switch to the OPERATE position. The adjust mode lamp should not be lit, and the data enable lamp should be lit only if the modem is detecting data.

4.9 HIGH STABILITY OSCILLATOR

Readjust the HSO if necessary and place the station back in service.

4.10 ALIGNMENT PROCEDURE FOR BINARY MODE FREQUENCY OFFSET

4.10.1 If a frequency offset in the binary mode is desired, the entire alignment procedure is the same as previously described except for replacing paragraph 4.6 with the following procedure:

4.10.2 Digital Modulator (+ DEV and – DEV)

Step 1. Set the panel switch on the synthesizer to the OPERATE position.

Step 2. Set the switch on the TSI module to the TEST position.

Step 3. Pulse Insertion: Select the + DEVIATION position of the switch on the TSI module. Set R176 (+ DEV) on the synthesizer panel for the transmitter output frequency of $F_T + 4.000$ kHz + offset.

Step 4. Pulse Blanking: Select the – DEVIATION position of the switch on the TSI module. Set R177 (– DEV) on the synthesizer panel for transmitter output frequency of $F_T - 4.000$ kHz + offset.

Example: Desired OFFSET = + 100 Hz,
using + DEV: $F = F_T + 4.1$ kHz;
using – DEV: $F = F_T - 3.9$ kHz.

Step 5. Return the TEST switch on the TSI module to the normal position.

5. OPERATIONAL TESTS

5.1 REGULATORS

Check both the 9.6 V dc ± 0.5 V and 5 V dc ± 0.1 V regulators for proper operation.

5.2 REFERENCE LOOP

Jumpers JU20 and JU21 determine which External Reference frequency is applied to the synthesizer and are “in” or “out” accordingly (see note 4 on synthesizer schematic diagram). With the proper input signal applied, check for the following:

- 100 kHz signal at U17-1,2 (Phase Detector)
- 14.4 MHz signal at collector of Q19
- U18 Steering Line (TP1) set for 1.5 V dc

5.3 MAIN LOOP

In order to test the Main Loop, the Reference Loop must be functioning normally, U604 (ROM), and the channel element must be installed, and jumpers JU22-JU25 removed accordingly. With these conditions met, perform the following tests:

- Check for 7.2 MHz signal at U602-2.
- Check that Multiplier metering positions 1, 2 and 3 are normal when L703, L704, and L705 are tuned.
- Check for a VHF signal of approximately 1 V P/P (350 mV rms) at U601-1.
- Check for a VHF signal of approximately 225 mV rms at U602-25.
- Check for a 2.083 kHz (for UHF and 900 MHz units) or a 2.5 kHz (for LB and HB units) square wave signal of approximately 4 V P/P at U603-2.
- Check for 2.083 kHz or 2.5 kHz signal pulses of approximately 2.8 V P/P at U603-23.
- Check for 2.083 kHz or 2.5 kHz Truncated ramp signal greater than or equal to 1.4 V P/P at U603-24.
- Check that the voltage at U603-15 is at least 3 V dc but not more than 8 V dc (no ac voltage present).
- Check that the voltage at TP2 is at least 3 V dc but not more than 6 V dc (no ac voltage present).
- The RF output should be approximately 1.0 V rms when the RF ENABLE line is low (less than 0.7 V). When the RF ENABLE line is high, the RF output should be approximately 10 mV rms.

5.4 PULSE STUFFING CIRCUIT

(DATA ENABLE = 1, and JU1-JU8 removed accordingly)

- Check for a signal of approximately 12 kHz at 4 V P/P at U5-14 (Data = 0).
- Check for a signal of approximately 12 kHz at 4 V P/P at U6-14 (Data = 1).
- Check that $F_{RFOUT} = F_X - \text{approx. } 4 \text{ kHz} \div M$ when Data = 0.
- Check that $F_{RFOUT} = F_X + \text{approx. } 4 \text{ kHz} \div M$ when Data = 1.

NOTE

Where M = station multiplier; LB = 3, HB = 12, UHF = 36, and 900 MHz = 72.

5.5 DATA MODULATOR

Step 1. Set the panel switch on the synthesizer to the INSTANTANEOUS DEVIATION ADJUST position. The switch remains in this position for Steps 2, 3, and 4.

Step 2. Check for 2 V P/P at the junction of R174 and R19.

Step 3. Check for a 150 Hz square wave of approximately 4 V P/P at CE1-4. Adjust INSTANTANEOUS DEVIATION control R174 if necessary.

Step 4. Check that the voltage at U22-7 is at least 4 V dc but not more than 5 V dc, and is variable with the OFFSET control R175. Set this voltage to 4.8 V dc.

Step 5. Set the panel switch on the synthesizer to the OFFSET ADJUST position.

Step 6. Check for a square wave at U22-7. This waveform can be varied with the OFFSET control R175 above and below 4.8 V dc. Adjust R175 for minimum dc voltage shift between data and voice modulation (not critical).

5.6 VOICE MODULATION (Data Enable = 0)

Step 1. Apply a 1 kHz tone @ 1.4 V rms to the VOICE INPUT connector J1.

Step 2. Measure this 1 kHz tone at TP2. Level should be 3 V P/P.

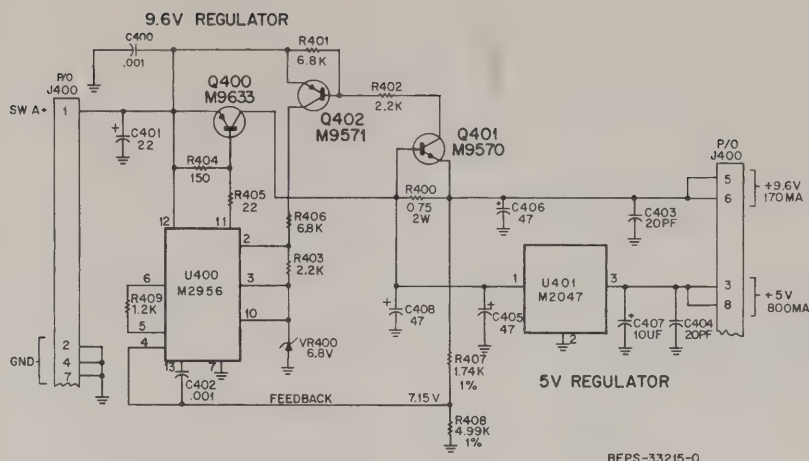
NOTE

If any of the previously described operational tests fail to perform as noted refer to the Synthesizer Troubleshooting Guide for further information.

6. TROUBLESHOOTING GUIDE AND PROCEDURE

Table 1. Paging Synthesizer Troubleshooting Guide

Symptom	Possible Causes
No RF output	RF Enable is not low. Q36, Q37, or Q701 is bad. CR1 is open or CR2 is shorted.
Out-of-Lock (Main Loop)	OFFSET ADJUST improperly set. JU22, 23, 24, 25 improperly installed. Multiplier not tuned or defective. ROM U604 defective. Defective Loss-of-Lock Detector circuit. R120 wrong value.
Out-of-Lock (Reference Loop)	U18 not properly tuned. Defective U18. JU20, JU21 improperly installed. Loss of HSO signal (External Ref.). Defective amplifier (Q21, Q20, Q19). Defective Loss-of-Lock Detector circuit.
Distorted Binary Modulation	Pulse stuffing/snatching (+ DEV and – DEV) not properly set, or defective. INSTANTANEOUS DEV not properly set, or defective. Voice Input not connected to station. JU22, 23, 24, 25 improperly installed. JU1-18 improperly installed. Defective amplifier (Q21, 20, 19). Defective oscillator U1, etc. Defective U21. Defective R173.
Mode change transients (BINARY to VOICE, etc.)	OFFSET ADJUST not properly set or defective. Station XCTR LEVEL improperly set. Line Level (600 ohms) too high to station.
Distorted Voice or Tone Modulation	Station XCTR LEVEL improperly set. Station IDC improperly set. JU22, 23, 24, 25 improperly installed. Defective U21. Defective R173. CE1 not tuned properly or defective.
Carrier Frequency in error by 2.083 kHz or 2.500 kHz, etc.	Defective U601. Defective U604. Defective program stored in U604.



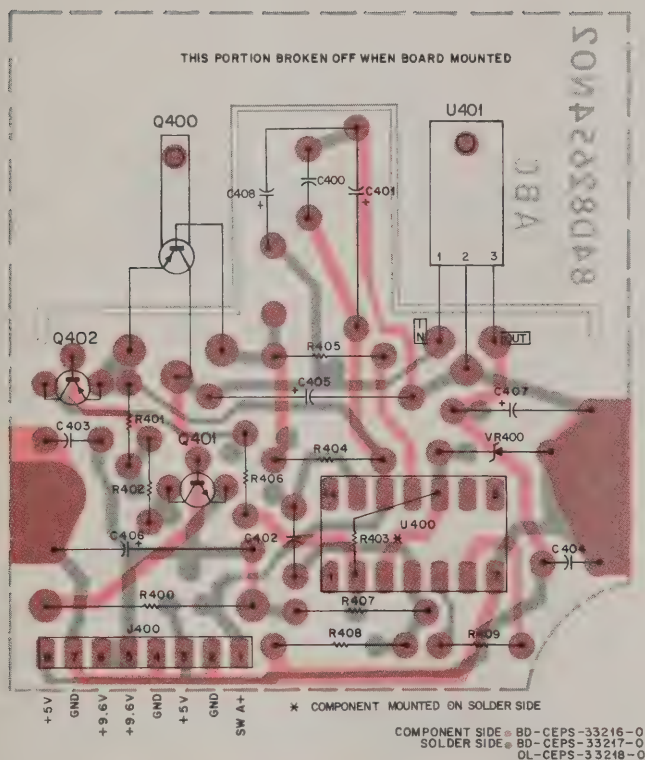
parts list

TRN5058A Voltage Regulator Board

PL-7660-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed: $\mu\text{F} \pm 10\%$; unless otherwise stated		
C400	21-83596E13	.001; 500 V
C401	23-84762H16	22; 20 V
C402	21-83596E13	.001; 500 V
C403, 404	21-11014H32	20 pF $\pm 5\%$; 100 V
C405, 406	23-83214C31	47 $\pm 20\%$; 15 V
C407	23-84762H03	10; 20 V
C408	23-83214C31	47 $\pm 20\%$; 15 V
connector, plug:		
J400	28-83323N02	male; 8-contact
transistor: (see note)		
Q400	48-869633	PNP; type M9633
Q401	48-869570	NPN; type M9570
Q402	48-869571	PNP; type M9571
resistor, fixed: ohms $\pm 5\%$; 1/4 W; unless otherwise stated		
R400	17-82036G13	0.75; 2 W
R401	6-185A69	6.8k; 1/8 W
R402, 403	6-185A57	2.2k; 1/8 W
R404	6-11009A29	150
R405	6-11009A09	22
R406	6-185A69	6.8k; 1/8 W
R407	6-10621C18	1740 $\pm 1\%$
R408	6-10621C62	4990 $\pm 1\%$
R409	6-185A51	1.2k; 1/8 W
integrated circuit: (see note)		
U400	51-83629M56	regulator; 9.6 V
U401	51-84320A47	regulator; 5 V
voltage regulator: (see note)		
VR400	48-82256C37	Zener; 6.8 V; 1 W

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

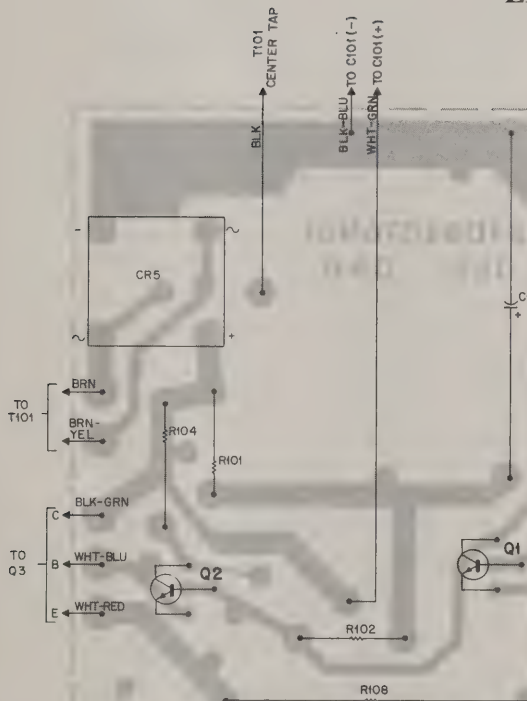


SHOWN FROM COMPONENT SIDE

TRN5058A Voltage Regulator Board
Schematic Diagram, Circuit Board Detail,
and Parts List
Motorola No. PEPS-34965-O
6/3/83 - V & G

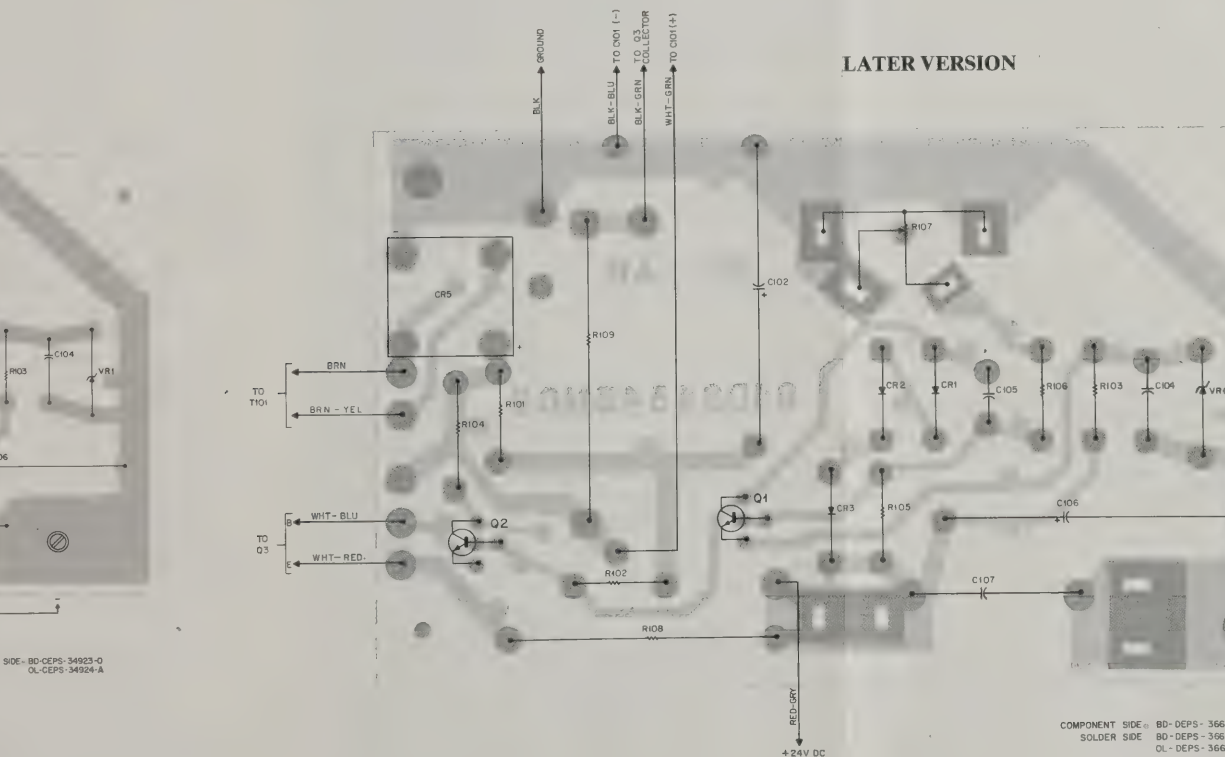
QCE DL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
	23-83093G21	2000 uF + 100 - 10%; 100 V
		fuse:
	65-475395	1/2 amp; 125 V; slow blow type
		transistor: (see note)
	48-869627	NPN; type M9627
		switch:
	40-84241G03	2 position; slide
		transformer:
	25-83043L01	pri: #1 BLK-WHT, BLK-GRN; res. 29 ohms pri: #2 BLK-YEL, BLK-RED; res. 32 ohms sec: BRN, BRN-YEL with BLK center tap; res. 1 ohm
		terminal board:
	31-120965	4 contact
		connector, plug:
	28-83176L01	male; 3-contact
mechanical parts		
	2-119913	NUT, 8-32 x 11/32 x 1/8"; 4 used
	3-122922	SCREW, machine: 6-32 x 5/8"; 2 used
	3-134212	SCREW, tapping: 4-40 x 5/16"; 4 used
	3-134169	SCREW, tapping: 4-40 x 1/4"; 4 used
	3-135575	SCREW, tapping: 6-32 x 5/16"; 4 used
	3-136934	SCREW, tapping: 6-32 x 3/8"; 6 used
	4-844093	WASHER, shoulder; 4 used
	7-83181L01	BRACKET, fuseholder
	7-84139N01	BRACKET, heat sink mounting; 2 used
	9-82083C03	RECEPTACLE, fused
	9-82673A01	SOCKET, transistor; 3 used
	9-83175L01	RECEPTACLE, female; 3 contact
	14-865854	INSULATOR, transistor
	14-84309N01	INSULATOR, paper
	15-83559L01	COVER, transistor
	26-84212E02	HEAT SINK
	29-84151L01	TERMINAL, socket; 3 used
	29-847854	LUG, tongue
	29-84150L01	TERMINAL, plug; 3 used
	42-10217A02	STRAP, tie; 10 used
	42-83123F01	RETAINER; 6 used
	54-84789L01	LABEL, WARNING
	30-83211C04	CABLE and PLUG AC
	37-107998	SLEEVING
	29-812979	LUG, crimp terminal; 4 used

imum performance, diodes, transistors, and integrated circuits must
Motorola part numbers.



SHOWN FROM

TPN1195A Power Supply Schematic Diagram,
Circuit Board Detail, and Parts List
Motorola No. PEPS-34988-A
6/3/83 - V & G



INSTANTANEOUS
DEVIATION

DATA
MODULATOR

OFFSET

ED VOICE (0-3KHZ)

VOICE

CRYSTAL
OSC
VCXO
10-16.7MHZ

AMP

BUFFER

R.F. ENABLE

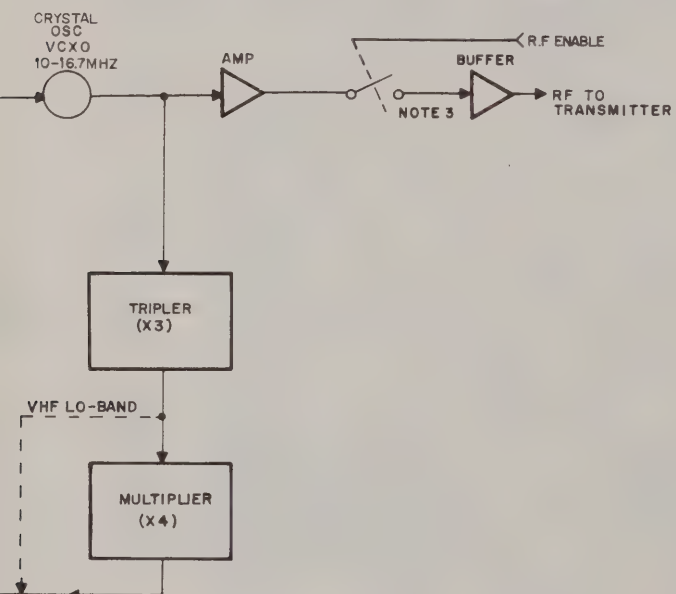
NOTE 3

RF TO
TRANSMITTER

TRIPLER
(X3)

VHF LO-BAND

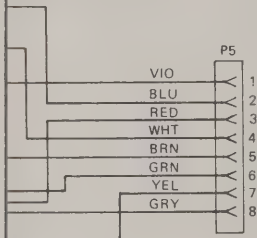
MULTIPLIER
(X4)



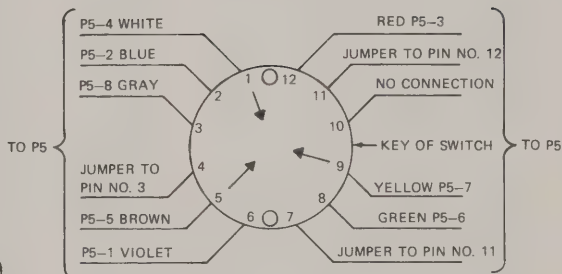
FROM

DETAIL A

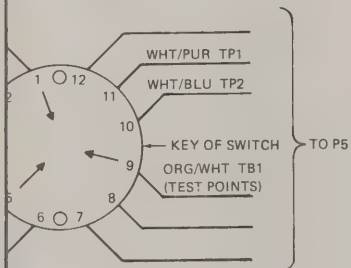
ADJUST MODE SWITCH
SWITCH SHOWN IN
OPERATE MODE



DETAIL B
ADJUST MODE SWITCH



DETAIL C
ADJUST MODE SWITCH



IS AND DELETE
E TB2 OR HSO.

GDEPS-34949-C

Paging Synthesizer Intercabling Diagram
Motorola No. GDEPS-34949-C
9/15/83 - V&G

1. JUMPER CHART

HSO FREQ.	JU20	JU21
10 MHz	IN	OUT
5 MHz	IN	IN
1 MHz	OUT	IN
0.1 MHz	OUT	OUT

HSO FREQ.	JU20	JU21
10 MHz	IN	OUT
5 MHz	IN	IN
1 MHz	OUT	IN
0.1 MHz	OUT	OUT

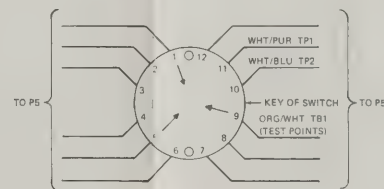
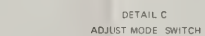
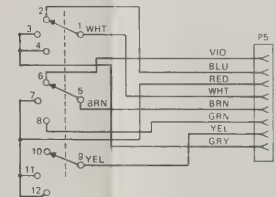
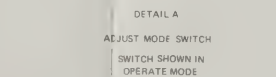
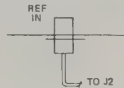
BAND (MHz)	F ₊ (MAX)	F ₊ (MIN)	DIVIDE NO.	DEV. OSC MAX	DEV. OSC MIN
928-960	67.269 Hz	60 Hz	240	14.866 KHz	14.40 KHz
460-510	178 Hz	112.5 Hz	120	13.360 KHz	13.50 KHz
150-174	384 Hz	321.034 Hz	40	15.360 KHz	13.24 KHz
36-50	1920 Hz	1152 Hz	10	19.20 KHz	11.520 KHz
30-36	1920 Hz	1152 Hz	8	15.360 KHz	9.2160KHz
132-150	436 Hz	384 Hz	32	13.952 KHz	12.288 KHz
406-420	137 Hz	107 Hz	96	13.632 KHz	13.152 KHz

BAND (MHz)	F ₊ (MAX)	F ₊ (MIN)	DIVIDE NO.	DEV. OSC MAX	DEV. OSC MIN
928-960	67.269 Hz	60 Hz	240	14.866 KHz	14.40 KHz
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132-150	436 Hz	384 Hz	32	13.952 KHz	12.288 KHz
406-420	137 Hz	107 Hz	96	13.632 KHz	13.152 KHz

3. $F_x = F_t/72$ (900 MHz)
 $F_x = F_t/36$ (450–512 MHz)
 $F_x = F_t/12$ (150–174 MHz)
 $F_x = F_t/3$ (30–50 MHz)
 F_x = CHANNEL ELEMENT
 FREQUENCY
 F_t = TRANSMIT FREQUENCY

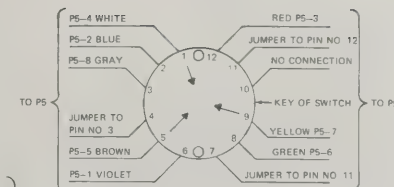


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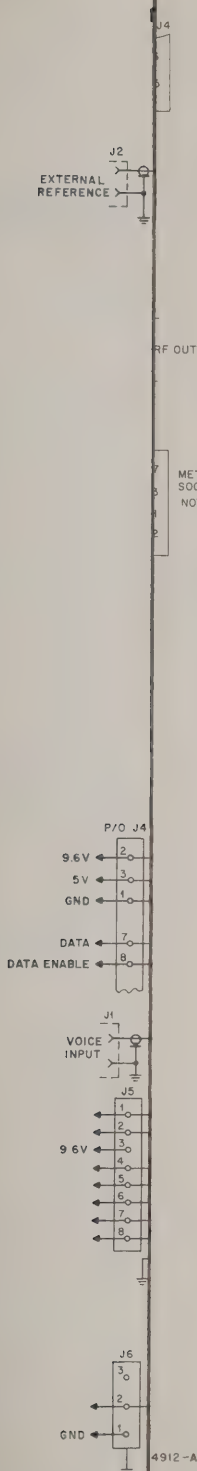
NOTE
MULTIFREQUENCY MODELS AND DELETE
HSO MODELS DO NOT HAVE TB2 OR HSO.

GDEPS-34949-C



NENT SIDE





- 1 Unless otherwise indicated resistor values are in ohms, capacitor values are in microfarads, and inductor values are in millihenries
- 2 Integrated circuits on this board are TTL & CMOS devices
- 3 IC types and connections for this board are as follows.

Reference Designation	Type	VCC	Gnd	Mfg's Description
U1	71K76	14	7	Dual Timer
U3, 4, 5, 6, 7, 8	84L38	16	8	Presetable - N Counter
U9	61L04	14	7	Quad 2-Input NAND Gate
U10	61L15	14	7	Dual D Flip-Flop
U11	27M11	14	7	Quad 2-Input NAND Gate
U12	48M23	14	7	Quad 2-Input Exclusive OR Gate
U13	61L15	14	7	Dual D Flip-Flop
U14, 15	61L10	5		Decade Counter
U16	71K37	16	8	Dual 4-Input Multiplexer
U17	09M79	14	7	Quad 2-Input Exclusive OR Gate
U18	91B02	—	—	14.4 Osc
U19, 20	61L85	5	6, 7, 10	One - 12 Counter
U21	29M81	4	11	Quad Op Amp
U22	29M32	8	4	Dual Op Amp
U23	84L62	16	8	Programmable Timer
U601	68F68	—	4	- 3 - 4 Prescaler
U602	68F63	10	4	Prog Divider
U603	68F59	16	16	Sample & Hold Phase Det
U604	89L03	16	8	ROM
U606	71K74	3	12	Quad Comparator
U607	71K94	14	7	Quad 2-Input OR Gate
U609	29M32	14	7	Dual Op Amp

JU21	JU20	External Reference
IN	IN	5 MHz
OUT	IN	10 MHz
IN	OUT	1 MHz
OUT	OUT	100 kHz

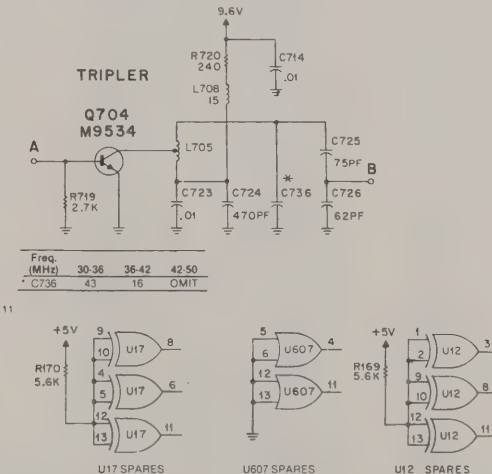
- 5 Set the meter selection switch to position D for multiplier tuning

Band	C80
30-50 MHz	.001
All Others	47 pF

Band (MHz)	C42	C43	R25	R26
30-36	4000	4000	9090	9090
36-42	3900	3900	8660	8660
42-50	4700	4700	8450	8450
VHF				
150-174				
UHF				
450-512				
900				
UHF	5000	5000	7680	7680
406-420				
VHF	5000	5000	7680	7680
132-150				

- 8 C19A is mounted on solder side of board
- 9 Dashed line is a wire jumper in place for low band operation

- 10 For Low Band, connect this circuit between points A & B



- 12 Foil shields connected to the phase detector output circuit (denoted by dashed lines) surround pins U603-12, 13, and 24 as well as much of the adaptive filter section

13 JUMPER TABLE

	Jumpers Used
Low Band - 30-36 MHz	JU5, 7, 15, 16, 22, 24
Low Band - 36-42 MHz	JU6, 8, 15, 16, 22, 24
Low Band - 42-50 MHz	JU6, 8, 15, 16, 22, 24
High Band - 136-174 MHz	JU3, 6, 8, 9, 14, 17, 23, 25
UHF Band - 450-512 MHz	JU1, 4, 6, 8, 10, 11, 13, 18, 23, 25
900 MHz Band	JU2, 3, 4, 6, 8, 10, 12, 13, 18, 23, 25
UHF Band - 132-150 MHz	JU3, 5, 7, 9, 14, 17, 23, 25
UHF Band - 406-420 MHz	JU1, 4, 5, 7, 10, 11, 13, 18, 23, 25

14 COMPONENT USAGE TABLE

Band	R137	R134	R700	R120	C23	C77	R180
30-50 MHz	30k	15k	2.2k	0	1 uF	47 uF	100k
150-174 MHz	30k	15k	2.2k	11k	1 uF	47 uF	100k
450-512 MHz	68k	15k	2.2k	100k	1 uF	47 uF	100k
928-960 MHz	68k	7.5k	680	100k	0.47 uF	0.1 uF	220k
132-150 MHz	51k	15k	2.2k	11k	1 uF	47 uF	100k
406-420 MHz	68k	15k	2.2k	100k	1 uF	47 uF	100k

Band	R75	R121	C715	C716	C721	C722	C725	C726
30-50 MHz	100k	1k	—	—	—	—	75 pF	62 pF
150-174 MHz	100k	1k	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
450-512 MHz	100k	1k	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
928-960 MHz	62k	680	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
132-150 MHz	100k	1k	150 pF	100 pF	120 pF	68 pF	20 pF	13 pF
406-420 MHz	100k	1k	150 pF	100 pF	120 pF	68 pF	20 pF	13 pF

Paging Synthesizer Schematic Diagram,
Circuit Board Detail, and Parts List
Motorola No. PEPS-34989-B
(Sheet 2 of 3)

9/15/83 - V&G

900 MHZ SYNTHESIZER BOARD



SHOWN FROM COMPONENT SIDE



MOTOROLA INC.

Communications
Sector

TLN2559B PURC™ SIMULCAST CONTROL MODULE

1. GENERAL DESCRIPTION

1.1 The TLN2559B Simulcast Control Module (SCM) is a plug-in unit for the remote control chassis of a *PURC* paging station. The SCM consists of two circuit boards, TRN5379B Control Board and TRN5603B Logic Board, fixed together to form the module. The SCM replaces the function tone decoder in the *PURC* station, providing the keying function to the paging transmitter in response to input signals Push-To-Talk (PTT) Control or Line PTT. Key-up output signals are provided on the Channel Element Ground, PL Enable, F1 Ground, and F2 Ground lines.

1.2 The TRN5379B Control Board has the interface circuitry required to connect the microcomputer on the TRN5603B Logic Board to the base station and an on-board power supply to run the logic board.

1.3 The TRN5603B Logic Board contains the MC6803 microcomputer, program ROM, code selector switches, and the support devices for the microcomputer.

2. OPERATION

2.1 The basic function of the SCM is to decode function tone (FT) inputs and key or disable the transmitter in response to correct codes. The key-up request lines on the SCM have different levels of priority. PTT Control is an immediate-response input with lower priority than Line PTT. Line PTT initiates the microcomputer examination of the FT input line. The FT input goes through waveshaping circuitry and is then applied to the microcomputer. The microcomputer compares the FT input sequence to the code set in the selector switches to determine if the transmitter should be keyed up or not. The group and function tone selection is done according to Table 1 and Table 2.

Table 1. Group Selection

Group	G0	G1
0	ON	ON
I	OFF	OFF
II	ON	OFF
III	OFF	ON

Note: Station cannot be disabled when Group 0 is selected.

2.2 The SCM provides the Delayed Keyed A+ signal to the *PURC* station in response to a Keyed A+ input signal. The Delayed Keyed A+ stays active for about 300 milliseconds after the Keyed A+ signal drops out. This delay allows the station to have an active A+ signal during temporary losses of Keyed A+ that can occur during mode changeover sequencing. Delayed Keyed A+ also keeps the SCM active during these short periods.

2.3 A Line PTT input signal causes the SCM to generate DC Line Disable and FT Window Control signals. DC Line Disable causes the Guard Tone Module to hold Line PTT active. If the function tone sequence stops before the SCM detects KT1, the FT Window Control times out and DC Line Disable also becomes inactive about 60 milliseconds after tone input stops. If the microcomputer detects too many function tones, the DC Line Disable is dropped. In either case the latest tones are wiped from memory and the SCM returns to input line scanning. In normal operation the FT Window Control closes and DC Line Disable drops after the SCM detects KT1.

Table 2. Function Tone Selection

Tone Switch	Tone Frequency (Hz)
T10	750
T9	950
T8	1050
T7	1150
T6	1250
T5	1350
T4	1450
T3	1550
T2	1650
T1	1750

KT1, end-of-sequence indicator tone, is 1950 Hz.

KT1A, Group I-to-Group II mark, is 850 Hz.

KT1B, Group II-to-Group III mark, is 2350 Hz.

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parts list

TLDS32A Synthesizer Board, 132-150 MHz
 TLD333A Synthesizer Board, 150-174 MHz
 TLE481A Synthesizer Board, 406-420 MHz
 TLE482A Synthesizer Board, 450-512 MHz
 TLF682A Synthesizer Board, 928-960 MHz

FL5882A Synthesizer Board, 928-960 MHz		PL-0501
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: 5 + 10%; 100 V; unless otherwise stated
C2	21-11014H32	20 pF ± 5%, 50 V
C3	21-11015A07	0.1 ± 80-20%, 50 V
C4	21-11014H32	20 pF ± 5%, 50 V
C5	21-11015B05	220 pF
C6	21-8207844	100 pF
C8	21-11014H32	20 pF ± 5%, 50 V
C9	21-11015B05	220 pF
C10	8-11017B17	0.1 ± 50 V
C11	23-11013F10	0.56 35 V
C12	21-11015B05	220 pF
C13	8-11017B17	0.1 ± 50 V
C14	21-11015A07	0.1 ± 80-20%
C15	21-11015B05	220 pF ± 5%
C16	21-11015A07	0.1 ± 80-20%
C17	8-11017B07	0.068 50 V
C18	23-11013G15	4.7 ± 20%, 20 V
C19	23-84538C06	47 ± 20%, 20 V
C19A	21-11015B01	100 pF
C20	8-80027B08	0.039 ± 5%
C21	8-11017B06	0.047 50 V
C22	8-11017B01	0.01 50 V
C23	23-84538C14	1.3 ± 20%
C24	or 23-84782H14	0.47 (928-960 MHz)
C25	8-80028B04	5.50 V
C26	21-11015A07	0.1 ± 80-20%
C27	21-11015B01	100 pF
C28	8-80028B04	5.50 V
C30	23-84538C05	10.0 (928-960 MHz)
C40	21-11015A07	0.1 (928-960 MHz)
C42, C43	21-82537B49	3900 pF ± 1%; 150-174 MHz, 450-512 MHz, 928-960 MHz
	or 21-82537B45	5000 pF ± 5%; (132-150 MHz, 406-420 MHz)
C44, 45	21-11015A07	0.1 ± 80-20%
C46	21-11014H44	62 pF ± 5%
C54 thru 56	23-84538C04	15
C57	23-84538C04	15
C58, 59, 60	21-11015A07	0.1 ± 80-20%
C61, 62	21-82537B03	0.1 ± 80-20%; 25 V
C63	23-84538C04	15
C64 thru 68	8-11015A07	0.1 ± 80-20%
C69	23-11013G15	4.7 ± 20%, 20 V
C70 thru 73	21-11015A07	0.1 ± 80-20%
C74	8-8313H23	0.08 ± 5%, 50 V
C75	9-3313H17	0.063 ± 5%
C76	7-84426B48	665 pF ± 5%, 500 V
C77	23-84538C29	47 ± 20%, 10 V
	or 23-84538C03	10.0 (928-960 MHz)
C78, 79	21-11015A07	0.1 ± 80-20%
C80	21-11014H41	247 pF ± 5%
C81	8-82596C03	0.07 ± 5%, 50 V
C82, 83	21-11015A07	0.1 ± 80-20%
C84	23-84538C29	47 ± 20%, 10 V
C85, 86	21-84494B29	10 pF ± 5%, 500 V
C87, 88	23-84538C29	47 ± 20%, 10 V
C89	21-11015A07	0.1 ± 80-20%
C91	21-11015A07	0.1 ± 80-20%
C93	23-84538C29	47 ± 20%, 10 V
C94, 95	21-11015A07	0.1 ± 80-20%
C96	8-11017B01	0.01 50 V
C97	21-11015A07	0.1 ± 80-20%
C98	21-11015A07	0.001 (928-960 MHz)
C99	23-84538C06	47 ± 20%, 20 V
C200	21-82537B04	0.05 ± 80-20%; 25 V
C202	21-11015A07	0.1 ± 80-20%
C203 thru 213	21-11015A07	0.1 ± 80-20%
C701 thru 703	21-11015A07	0.1 ± 80-20% (see note)
C704	21-11015B01	100
C705	21-8443B02	22 pF ± 5%, 50 V
C711	21-83406D44	47 pF ± 5%, 50 V
C712	21-11015A07	0.1 ± 80-20%
C713	21-11015B09	470 pF
C714	21-11015A07	0.1 ± 80-20%
C715	21-82610C29	120 pF (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C70	150 pF ± 5%; NPO, (132-150 MHz, 406-420 MHz)
C716	21-82610C42	82 pF ± 5%, 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C44	100 pF ± 5%; N220, (132-150 MHz, 406-420 MHz)
C717	21-84493B02	22 ± 5%, 50 V
C718, 719	21-11014H41	47 pF ± 5%
C720	21-82596C13	0.01 300 V
C721	21-82610C44	100 pF ± 5%; 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C09	120 pF ± 5%; N220, (132-150 MHz, 406-420 MHz)
C722	21-82610C03	47 pF ± 5%; 200 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C30	68 pF ± 5%; N330, (132-150 MHz, 406-420 MHz)
C723	21-11014H25	10 pF ± 0.5 pF

Paging Synthesizer Schematic Diagram,
 Circuit Board Detail, and Parts List
 Motorola No. PEPS-3499-B
 (Sheet 3 of 3)
 9/26/83.

900 MHZ SYNTHESIZER BOARD

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R23	6-11009B81	22k
R24	6-11009A37	330
R25, 26	6-84375L15	9090 ± 0.5% (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 6-84376L09	7.88 ± 0.5% (132-150 MHz, 406-420 MHz)
R27	6-11009E37	330
R28	6-11009A73	10k
R40	6-11009A89	47k
R40A	6-11009E88	47k
R41	6-11009E73	10k
R42 thru 51	6-11009A73	10k
R52	6-11009A39	390
R53	6-11009E73	2.7k
R54	6-11009E49	1k
R55	6-11009C18	10k
R56	6-11009E25	10k
R57	6-11009E81	22k
R58	6-11009A49	1k
R59	6-11009E65	4.7k
R60, 61	6-11009A67	5.6k
R62	6-11009A73	960
R63	6-11009E73	10k
R64, 65	6-11009A73	10k
R66	6-11009A41	470
R67, 68	6-11009A29	150
R70, 71	6-11009A51	1.2k
R71A	6-11009A18	51
R72	6-11009A17	47
R73, 74	18-84143N01	20k
R75	6-11009E97	100k (132-174 MHz, 406-512 MHz)
	or 6-11009E92	62k (928-960 MHz)
R76	6-11009E98	120k
R77	6-11009E88	43k
R78	6-11009E84	4.3k
R79	6-11009E39	300
R80	6-11009E73	10k
R81	6-11009E77	15k
R82	6-11009A77	10k
R83, 84	6-11009A67	5.6k
R85	6-11009A57	2.2k
R86	6-11009A87	5.6k
R87	6-11009A89	47k
R88	6-11009A87	5.6k
R89	6-11009A89	47k
R90	6-11009A73	10k (928-960 MHz)
	or 6-11009E73	10k (928-960 MHz)
R91, 92	6-11009E59	2.7k
R93, 94	6-11009E65	4.7k
R95	6-11009E57	2.2k
R96	6-11009E75	12k
R97	6-11009E66	5.1k
R98, 99, 100	6-11009A67	5.6k
R101	6-11009A48	1k
R102	6-11009A35	270
R103	6-11009A49	1k
R104	6-11009A85	4.7k
R105	6-11009A41	470
R106	6-11009A87	5.6k
R107, 108	6-11009A41	470
R109	6-11009A85	4.7k
R110	6-11009E45	680
R111	6-11009A29	330
R112	6-11009A39	390
R113	6-11009A73	220
R114	6-11009A41	10k
R115	6-11009A58	2k
R116	6-11009A59	2.7k
R117, 118	6-11009A67	5.6k
R119	6-11009E73	10k
R120	6-11009E77	15k
R121	6-11009E49	1k
	or 6-11009E49	680 (928-960 MHz)
R122	6-11009E73	10k
R123, 125	6-11009A89	47k
R124	6-11009A73	10k
R125, 126	6-11009A89	47k
R127	6-11009A73	10k
R131, 132	6-11009E89	47k (928-960 MHz)
R133	6-11009B14	47k
R134	6-11009A77	15k (132-174 MHz, 406-512 MHz)
	or 6-11009A70	7.5k (928-960 MHz)
R135, 136	6-11009A77	15k
R137	6-11009A84	30k (150-174 MHz)
	or 6-11009A90	31k (132-150 MHz)
	or 6-11009A93	68k (406-512 MHz, 928-960 MHz)
R138	6-11009A77	15k
R139	6-11009A91	56k
R140	6-11009A89	120k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R141	6-11009A87	5.6k
R142	6-11009A44	620
R143	6-11009A87	39k
R146	6-11009A85	4.7k
R147	6-11009A59	2.7k
R148	6-11009A89	47k
R149	6-11009A19	56
R150	6-11009E73	10k
R151	6-11009A73	10k
R152	6-11009E73	10k
R153	6-11009E49	1k
R154	6-11009E23	82
R155	6-11009E71	8.2k
R156	6-11009E49	1k
R157	6-11009C18	10k
R158	6-11009E73	10k
R159	6-11009E81	22k
R160	6-11009E85	4.7k
R161, 162	6-11009E59	2.7k
R163	6-11009E33	220
R164, 165	6-11009E73	10k
R166, 167	6-11009E71	8.2k
R168	6-11009E91	56k
R169	6-11009E87	5.6k
R171	6-11009E75	12k
R172	6-11009C72	9.1k
R174	18-84143N08	variable; 50k
R175, 176, 177	18-84143N15	variable; 10k
R178	6-11009A97	100k
	or 6-11009B06	220k (928-960 MHz)
R208	6-11009E98	120k
R209	6-11009E51	1.2k
R210	6-11009E89	47k
R211	6-11009A73	10k
R212	6-11009A89	47k
R213	6-11009A85	4.7k
R214	6-11009A73	10k
R216	6-11009A57	2.2k
	or 6-11009A45	680 (928-960 MHz)
R701	6-11009A95	82k (not used for 928-960 MHz)
R702	6-11009E75	12k (not used for 928-960 MHz)
R703	6-11009A18	51 (not used for 928-960 MHz)
R704	6-11009A29	150 (not used for 928-960 MHz)
R710	6-11009A65	4.7k
R711	6-11009A53	1.5k
R712	6-11009A18	51k
R713	6-11009A29	2.7k
R714	6-11009A59	2.7k
R715	6-124A34	240
R716	6-11009A49	1k
R717	6-11009A59	2.7k
R718	6-124A34	240
R719	6-11009E49	1k
R720	6-124A34	240
R722	6-11009A49	1k (not used for 928-960 MHz)
R723	6-11009A57	2.2k
R724, 725	6-11009A49	1k
R726	6-11009A61	3.3k
R727	6-11009A39	390
R728	6-11009A61	3.3k
R729	6-11009A73	10k
R730	6-11009A42	510
R731	6-11009A77	15k
R732	6-11009A53	1.5k
R733	6-11009A47	820
R734	6-11009A09	22k
R735	6-11009A85	33k
R736	6-11009E77	15k
R737	6-11009E35	270 (928-960 MHz only)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
RT800	6-858402	thermistor: 1k @ 25°C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U1	51-84371K78	dual timer
U3 thru 8	51-82984A38	presettable - N counter
U9	51-84561L04	quad 2-input NAND gate
U10	51-84561L15	dual "D" flip-flop
U11	51-83277M10	quad 2-input NAND gate
U12	51-82948M23	quad 2-input exclusive OR gate
U14, 15	51-84561L15	dual "D" flip-flop
U16	51-84561L10	decade counter
U17	51-84371K37	dual 4-line to 1-line multiplexer
U18	51-82929M17	2-input exclusive OR gate
	51-80291B02	14.4 oscillator

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U17	51-84371K37	dual 4-line to 1-line multiplexer
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U12	51-82948M23	quad 2-input exclusive OR gate
U14, 15	51-84561L15	dual "D" flip-flop
U16	51-84561L10	decade counter
U17	51-84371K37	dual 4-line to 1-line multiplexer
U18	51-82929M17	2-input exclusive OR gate
	51-80291B02	14.4 oscillator

		thermistor:
RT900	6-858402	1k @ 25 °C
		Integrated circuit: (see note)
U1	51-84371K76	dual timer
U3 thru 8	51-82984A38	presettable - N counter
U9	51-84561L04	quad 2-input NAND gate
U10	51-84561L15	dual "D" flip-flop
U11	51-83627M11	quad 2-input NAND gate
U12	51-82984M33	quad 2-input exclusive OR gate
U13	51-84561L15	dual "D" flip-flop
U14, 15	51-84561L10	decade counter
U16	51-84371K37	dual 4-line to 1-line multiplexer
U17	51-82679B02	quad 2-input NAND gate
U18	51-80291B02	14.4 oscillator



MOTOROLA INC.

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TLN2559B PURC™ SIMULCAST CONTROL MODULE

1. GENERAL DESCRIPTION

1.1 The TLN2559B Simulcast Control Module (SCM) is a plug-in unit for the remote control chassis of a *PURC* paging station. The SCM consists of two circuit boards, TRN5379B Control Board and TRN5603B Logic Board, fixed together to form the module. The SCM replaces the function tone decoder in the *PURC* station, providing the keying function to the paging transmitter in response to input signals Push-To-Talk (PTT) Control or Line PTT. Key-up output signals are provided on the Channel Element Ground, PL Enable, F1 Ground, and F2 Ground lines.

1.2 The TRN5379B Control Board has the interface circuitry required to connect the microcomputer on the TRN5603B Logic Board to the base station and an on-board power supply to run the logic board.

1.3 The TRN5603B Logic Board contains the MC6803 microcomputer, program ROM, code selector switches, and the support devices for the microcomputer.

2. OPERATION

2.1 The basic function of the SCM is to decode function tone (FT) inputs and key or disable the transmitter in response to correct codes. The key-up request lines on the SCM have different levels of priority. PTT Control is an immediate-response input with lower priority than Line PTT. Line PTT initiates the microcomputer examination of the FT input line. The FT input goes through waveshaping circuitry and is then applied to the microcomputer. The microcomputer compares the FT input sequence to the code set in the selector switches to determine if the transmitter should be keyed up or not. The group and function tone selection is done according to Table 1 and Table 2.

Table 1. Group Selection

Group	G0	G1
0	ON	ON
I	OFF	OFF
II	ON	OFF
III	OFF	ON

Note: Station cannot be disabled when Group 0 is selected.

2.2 The SCM provides the Delayed Keyed A+ signal to the *PURC* station in response to a Keyed A+ input signal. The Delayed Keyed A+ stays active for about 300 milliseconds after the Keyed A+ signal drops out. This delay allows the station to have an active A+ signal during temporary losses of Keyed A+ that can occur during mode changeover sequencing. Delayed Keyed A+ also keeps the SCM active during these short periods.

2.3 A Line PTT input signal causes the SCM to generate DC Line Disable and FT Window Control signals. DC Line Disable causes the Guard Tone Module to hold Line PTT active. If the function tone sequence stops before the SCM detects KT1, the FT Window Control times out and DC Line Disable also becomes inactive about 60 milliseconds after tone input stops. If the microcomputer detects too many function tones, the DC Line Disable is dropped. In either case the latest tones are wiped from memory and the SCM returns to input line scanning. In normal operation the FT Window Control closes and DC Line Disable drops after the SCM detects KT1.

Table 2. Function Tone Selection

Tone Switch	Tone Frequency (Hz)
T10	750
T9	950
T8	1050
T7	1150
T6	1250
T5	1350
T4	1450
T3	1550
T2	1650
T1	1750

KT1, end-of-sequence indicator tone, is 1950 Hz.

KT1A, Group I-to-Group II mark, is 850 Hz.

KT1B, Group II-to-Group III mark, is 2350 Hz.

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2.4 The Channel Element Grounds and PL Enable outputs become active after all conditions have been met. Since the Channel Element Grounds are the final transmitter key-up control, any condition that inhibits the transmitter causes these signals to become inactive.

3. CIRCUIT DESCRIPTION

3.1 INPUT CIRCUITS

3.1.1 PTT Key-Up Lines

The PTT inputs are normally high and go low when active. The 12 volt input is converted to a logic-compatible 5 volts by input buffer U14. The buffer outputs then go directly to the input port of microcomputer U1.

3.1.2 Keyed A+

The Keyed A+ signal is applied to transistor Q8. Q8 charges C13 and causes Q9 to saturate. Q10 is normally on at this time, but has no effect. When the Keyed A+ signal goes low, Q8 shuts off and C13 begins to discharge through the network of R19-R20-R21-R22-R25, keeping Q10 shut off. After the discharge time period set by C13 and the resistor network, Q10 conducts, shutting off Q9. Delayed Keyed A+ then goes low.

3.1.3 Function Tone Input

Sine wave tones from the audio line are applied to lower and upper peak detectors U10A and U10B, respectively. The peak levels are applied to opposite ends of divider network R26-R27-R28. Transmission gate U11 shifts the reference of comparator U10D to either the high-level or low-level reference point of the divider string. Since the circuit is wired in a hysteresis configuration, U11 selects the high-level reference if the input signal is below the reference point, and vice-versa. The output of U10D is a clean square wave signal which is passed through Q11, and then to the microcomputer.

3.2 OUTPUT CIRCUITS

DC Line Disable, FT Window Control, and the Channel Element Grounds are all transistor outputs driven directly from U1. PL Enable is driven by F1 Oscillator Ground through CR4, which allows PL Enable to be pulled low by another signal in the station without affecting F1 Oscillator Ground.

3.3 MICROCOMPUTER LOGIC

The central logic unit of the SCM is composed of microcomputer U1, octal latch U2, hex buffers U4 and U5 (with associated switch set S1), and address decoders

U6 and U7. Timers U8 and U9 perform a watchdog function, keeping track of the microcomputer "tickle pulses".

3.3.1 Microprocessor

U1 contains the master clock and timing generator, microprocessor, and 128 8-bit bytes of RAM. The processor communicates with the other circuitry of the SCM via four ports. Port 1 (pins 6-10) accepts the conditioned signals from the FT line and services the watchdog circuitry. Diodes CR9 and CR10 set the processor mode as "Extended Multiplexed." Port 2 (pins 13-19) handles all the input/output control signals. Port 3 (pins 22-29) provides the upper eight bits of the address bus. Port 4 (pins 30-37) provides the lower eight bits of address (through octal latch U2) and carries data from the data bus.

3.3.2 ROM

U3 contains the program information the processor needs to detect and process function tones. Address selection is done on pins 1-8, 19, 22, and 23. Data is brought out on pins 9-11 and 13-17.

3.3.3 FT Code Programming Circuit

FT codes are determined in switch set S1. The processor requests code information on address lines A14 and A15. The address decoder composed of U6 and U7 then allows the appropriate buffer to output switch code information to the data bus. The device to output data to the data bus is selected according to Table 3.

Table 3. Device Selection Address

Device	A14	A15
ROM	1	1
U4	1	0
U5	0	1
Not Used	0	0

3.3.4 Watchdog Circuit

In normal operation, U1 generates a "tickle pulse" on the P22 line (pin 10) every 66 milliseconds. A time window is established by monostables U8A and U9 during which the "tickle pulse" must occur. The incoming "tickle pulse" triggers both monostables. U9 times out before the next "tickle pulse" while U8A is continuously triggered. If the "tickle pulses" are too far apart, U8A times out. The Q output of U8A then triggers U8B, the reset pulse generator. If the "tickle pulses" occur too close together, U9 is still active when the next "tickle pulse" occurs and gate U6B clears U8A, again triggering the reset pulse generator. When U8B is triggered, the reset signal passes through Q13 and is sent to the reset pin of U1. The Q12-R44-C27 network allows the processor to generate a "tickle pulse" within about 6 milliseconds after the falling edge of the reset pulse. If

U1 does not generate a “tickle pulse” in this period, U8B sends another reset pulse. If the “tickle pulse” occurs normally, U8A is triggered and U8B is shut off.

4. TROUBLESHOOTING

4.1 EQUIPMENT REQUIRED

- DC, 15 MHz Dual-Trace Oscilloscope
- Audio Oscillator
- 15 MHz Frequency Counter
- Voltmeter
- TLN8799A Servicing Board Kit

4.2 FUNCTIONAL TESTS

To service the SCM it is necessary to first unplug the module, plug in the TLN8799A extension, and then plug the SCM into the extender board. The steel cover can be removed from the TRN5603B Logic Board to gain access to the microcomputer logic assembly.

4.2.1 Power Supply

Measure the voltage on control board pin 12 (A+), pin 10 (9.6 V), and U13 pin 3 (5 V). Correct any problems.

4.2.2 Delayed Keyed A+

Connect one oscilloscope channel to the Keyed A+ line at pin 24 of the control board. Connect the other channel to the Delayed Keyed A+ line at pin 8. Set the oscilloscope to trigger on a low-going transition occurring on Keyed A+. Apply 12 V to Keyed A+ by using the local PTT switch or a test switch. Release the PTT switch and observe the oscilloscope second channel trace. The trace should show a high-level signal which drops to ground after about 300 milliseconds. If the

trace drops immediately, check the timing network for Q10 to determine if there is a component failure. If the trace stays high, check Q9 and Q10.

4.2.3 Input Buffer

The input buffer is a non-inverting level shifter. 12 V input signals should result in 5 V level output signals. Check all inputs and their corresponding outputs for correct levels. Replace U14 to correct any problems.

4.2.4 Function Tone Conditioning Circuit

Connect the audio oscillator to pin 11 (FT HI) of the control board through a .01 uF capacitor. Set the frequency to 1 kHz and the amplitude to 6 V p-p. Probe the collector of Q11 (line P20) with the oscilloscope to see a 0-5 V 1 kHz square wave signal. Reduce the generator output to 0.6 V p-p. The P20 signal remains the same. Measure the dc level of FT HI with no audio signal applied. Apply signal and observe U11 pin 14 (the comparator reference point) with the oscilloscope. The dc level at this point is the same as that of FT HI, but with a square wave of about 10% of the audio signal level applied to FT HI. Vary the audio signal amplitude and observe the square wave signal amplitude change. If the comparator reference does not show this hysteresis effect, check peak detectors U10A and U10B and their associated components, and transmission gate U11.

4.2.5 Control Outputs

The SCM output circuits are simple transistor drivers. Note that PL Enable and F1 Oscillator Ground are returned to a connection in the paging station, not to the SCM ground return. Make all measurements of these leads referenced to the TX Ground, pin 11.

Table 4. SCM/Station Jumper Selection
(Refer to Station Module Jumper Charts)

Affected Board	Conditions	Action
Non-unified Main Board TRN5349A (Low Band and VHF 330 Watt Stations)	w/board part no. 84-84212N01	— remove JU15
	w/board part no. 84-83601N01	— remove JU15 — connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
Unified Main Board TRN4860A (Low Band through 960 MHz Low Power and UHF High Power)		— connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
TSI Module TRN4853A		— remove CR13 — remove R24 — add 47k resistor across C11
Station Control Module TRN4854A	Unified Chassis Stations	— remove Q12
Station Control Module TRN4854B		— remove JU8
Digital Modulator Module TRN4856A		— remove module
F1 Module TLN5293A w/ Optional Link Receiver		— remove C23 and C32
Guard Tone Decoder Module TLN2376A	systems with more than one rf link (more than 120 ms of HLGt)	— change C15 to 47 uF; 20%, 25 V tantalum (Motorola Part No. 23-82783B37) in the link transmitters and the paging station)

MULCAST CONTROL MODULE

CIRCUIT BOARD DETAIL TRN5379B CONTROL BOARD

parts list

TRN5379B Control Board

PL-8320-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed:		
C1, 3	21-11015B13	.001 uF \pm 10%; 100 V
C6	23-84538G06	47 uF \pm 20%; 20 V
C7, 8, 9	21-11015A05	.0047 uF \pm 80 - 20%; 100 V
C11	21-11015A07	.01 uF \pm 80 - 20%; 100 V
C12	21-82187B04	270 pF \pm 10%; 500 V
C13	23-84538G04	15 uF \pm 10%; 25 V
C14	21-82610C58	100 pF \pm 10%; 100 V
C15, 16	23-11019A09	1.0 uF \pm 20%; 50 V
C17, 18	21-82610C58	100 pF \pm 10%; 100 V
C19	21-11015B13	.001 uF \pm 10%; 100 V
C20	21-82187B04	270 pF \pm 10%; 500 V
C32, 33	23-84538G06	47 uF \pm 20%; 20 V
C34	21-11015A07	.01 uF \pm 80 - 20%; 100 V
C38, 39	21-11015B13	.001 uF \pm 10%; 100 V
C40	21-11015A05	.0047 uF \pm 80 - 20%; 100 V
C41	21-11015B13	.001 uF \pm 10%; 100 V
C42 thru 45	21-83406D81	20 pF \pm 5%; 500 V
C46	21-11015A05	.0047 uF \pm 80 - 20%; 100 V
diode: (see note)		
CR4, 5, 6	48-11034D01	silicon
CR7, 8	48-84616A01	Hot carrier
CR9	48-11034D01	silicon
transistor: (see note)		
Q5, 6	48-869642	NPN; type M9642
Q7	48-869567	NPN; type M9567
Q8	48-869642	NPN; type M9642
Q9	48-869328	PNP; type M9328
Q10	48-869643	PNP; type M9643
Q11	48-869642	NPN; type M9642
Q14	48-869567	NPN; type M9567
resistor, fixed; \pm 5%; 1/4 W;		
unless otherwise stated		
R1, 2	6-11009E65	4.7k
R3	6-11009E79	18k
R4	6-11009E65	4.7k
R5, 6	6-11009E73	10k
R9, 11	6-11009E97	100k
R15	6-11009E61	3.3k
R16	6-11009E79	18k
R17	6-11009E65	4.7k
R18	6-11009E73	10k
R19	6-11009E53	1.5k
R20	6-11009E83	27k
R21	6-11009E49	1k
R22	6-11009E45	680
R23	6-11009E75	12k
R24	6-11009E73	10k
R25	6-11009E53	1.5k
R26	6-11009E63	3.9k
R27	6-11009E47	820
R28	6-11009E63	3.9k
R29	6-11009E57	2.2k
R30	6-11009F22	1 meg.
R31, 32	6-11009E87	39k
R33	6-11009E93	68k
R72	6-11009E61	3.3k
R73	6-11009E79	18k
R74	6-11009E61	3.3k
R75	6-11009E79	18k
R76	6-11009E97	100k
R77	6-11009E61	3.3k
integrated circuit: (see note)		
U10	51-83629M09	Quad Low Power Operational Amplifier
U11	51-84887K60	Analog Multiplexer
U13	51-84561L76	Voltage Regulator (1.5A)
U14	51-82764K29	Hex Buffer
mechanical parts		
	2-132616	NUT, 6-32 \times 1/4 \times 3/32 \times 1/8"
	3-136194	SCREW, machine: 6-32 \times 3/8"
	7-84560N01	BRACKET, heat sink mounting
	26-84434N01	SHIELD

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

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SIMULCAST CONTROL MODULE

Table 4. SCM/Station Jumper Selection
(Refer to Station Module Jumper Charts)

Affected Board	Conditions	Action
Non-unified Main Board TRN5349A (Low Band and VHF 330 Watt Stations)	w/board part no. 84-84212N01	— remove JU15
	w/board part no. 84-83601N01	— remove JU15 — connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
Unified Main Board TRN4860A (Low Band through 960 MHz Low Power and UHF High Power)		— connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
TSI Module TRN4853A		— remove CR13 — remove R24 — add 47k resistor across C11
Station Control Module TRN4854A	Unified Chassis Stations	— remove Q12
Station Control Module TRN4854B		— remove JU8
Digital Modulator Module TRN4856A		— remove module
F1 Module TLN5293A w/ Optional Link Receiver		— remove C23 and C32
Guard Tone Decoder Module TLN2376A	systems with more than one rf link (more than 120 ms of HLGT)	— change C15 to 47 uF; 20%, 25 V tantalum (Motorola Part No. 23-82783B37) in the link transmitters and the paging station)

SIMULCAST CONTROL MODULE

CIRCUIT BOARD DETAIL
TRN5379B CONTROL BOARD

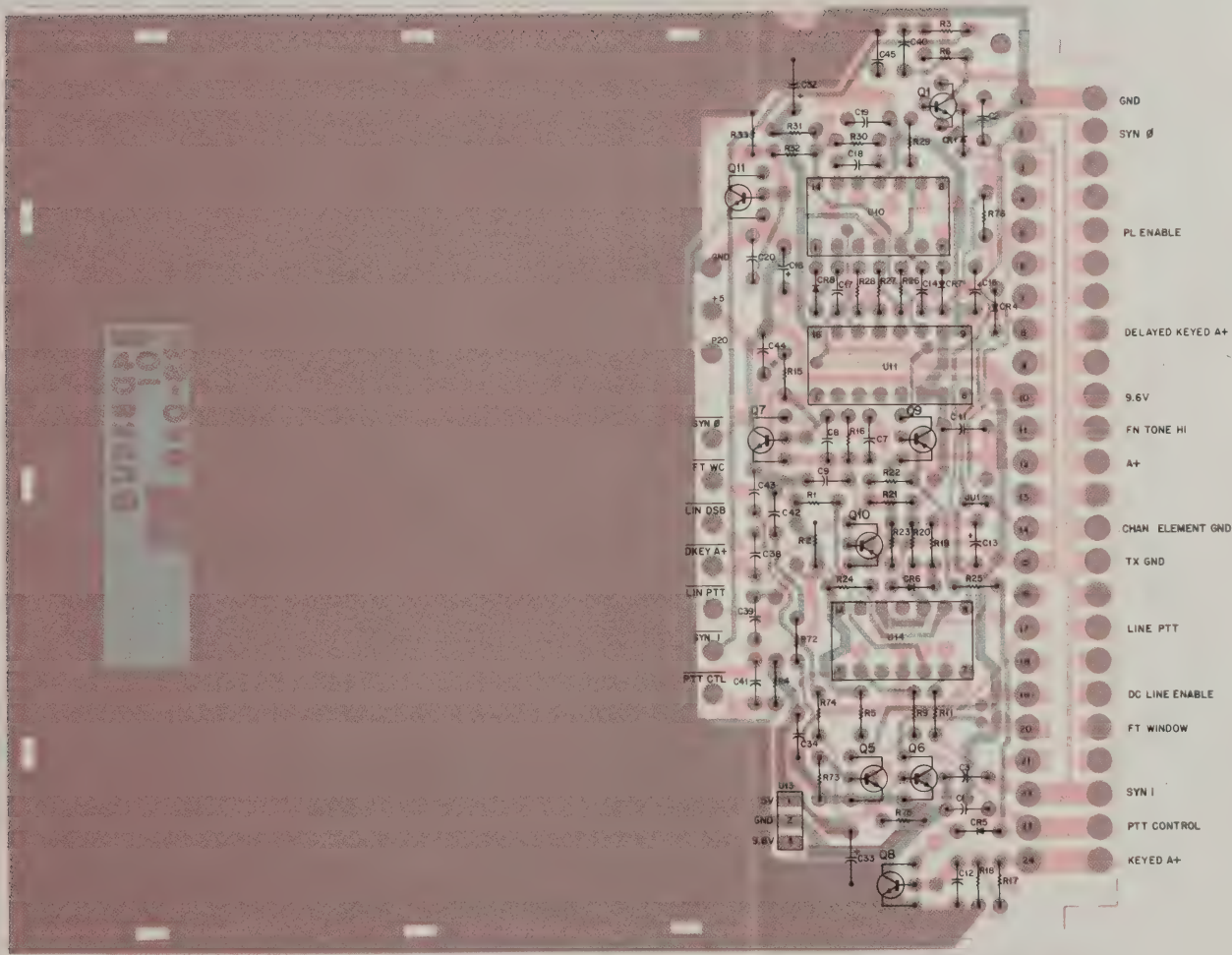
parts list

TRN5379B Control Board PL-8320-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 3	21-11015B13	capacitor, fixed: .001 uF ± 10%; 100 V
C6	23-84538G06	47 uF ± 20%; 20 V
C7, 8, 9	21-11015A05	.0047 uF ± 80 - 20%; 100 V
C11	21-11015A07	.01 uF ± 80 - 20%; 100 V
C12	21-82187B04	270 pF ± 10%; 500 V
C13	23-84538G04	15 uF ± 10%; 25 V
C14	21-82610C58	100 pF ± 10%; 100 V
C15, 16	23-11019A09	1.0 uF ± 20%; 50 V
C17, 18	21-82610C58	100 pF ± 10%; 100 V
C19	21-11015B13	.001 uF ± 10%; 100 V
C20	21-82187B04	270 pF ± 10%; 500 V
C32, 33	23-84538G06	47 uF ± 20%; 20 V
C34	21-11015A07	.01 uF ± 80 - 20%; 100 V
C38, 39	21-11015B13	.001 uF ± 10%; 100 V
C40	21-11015A05	.0047 uF ± 80 - 20%; 100 V
C41	21-11015B13	.001 uF ± 10%; 100 V
C42 thru 45	21-83406D81	20 pF ± 5%; 500 V
C46	21-11015A05	.0047 uF ± 80 - 20%; 100 V
CR4, 5, 6	48-11034D01	diode: (see note) silicon
CR7, 8	48-84616A01	Hot carrier
CR9	48-11034D01	silicon
Q5, 6	48-869642	transistor: (see note) NPN; type M9642
Q7	48-869567	NPN; type M9567
Q8	48-869642	NPN; type M9642
Q9	48-869328	PNP; type M9328
Q10	48-869643	PNP; type M9643
Q11	48-869642	NPN; type M9642
Q14	48-869567	NPN; type M9567
R1, 2	6-11009E65	resistor, fixed; ± 5%; 1/4 W; unless otherwise stated
R3	6-11009E79	4.7k
R4	6-11009E65	18k
R5, 6	6-11009E73	4.7k
R9, 11	6-11009E97	10k
R15	6-11009E61	100k
R16	6-11009E79	3.3k
R17	6-11009E73	18k
R18	6-11009E65	4.7k
R19	6-11009E73	10k
R20	6-11009E53	1.5k
R21	6-11009E83	27k
R22	6-11009E49	1k
R23	6-11009E45	680
R24	6-11009E75	12k
R25	6-11009E73	10k
R26	6-11009E53	1.5k
R27	6-11009E63	3.9k
R28	6-11009E47	820
R29	6-11009E63	3.9k
R30	6-11009E57	2.2k
R31, 32	6-11009F22	1 meg.
R33	6-11009E87	39k
R72	6-11009E93	68k
R73	6-11009E61	3.3k
R74	6-11009E79	18k
R75	6-11009E61	3.3k
R76	6-11009E79	18k
R77	6-11009E97	100k
U10	51-83629M09	integrated circuit: (see note) Quad Low Power Operational Amplifier
U11	51-84887K60	Analog Multiplexer
U13	51-84561L76	Voltage Regulator (1.5A)
U14	51-82764K29	Hex Buffer

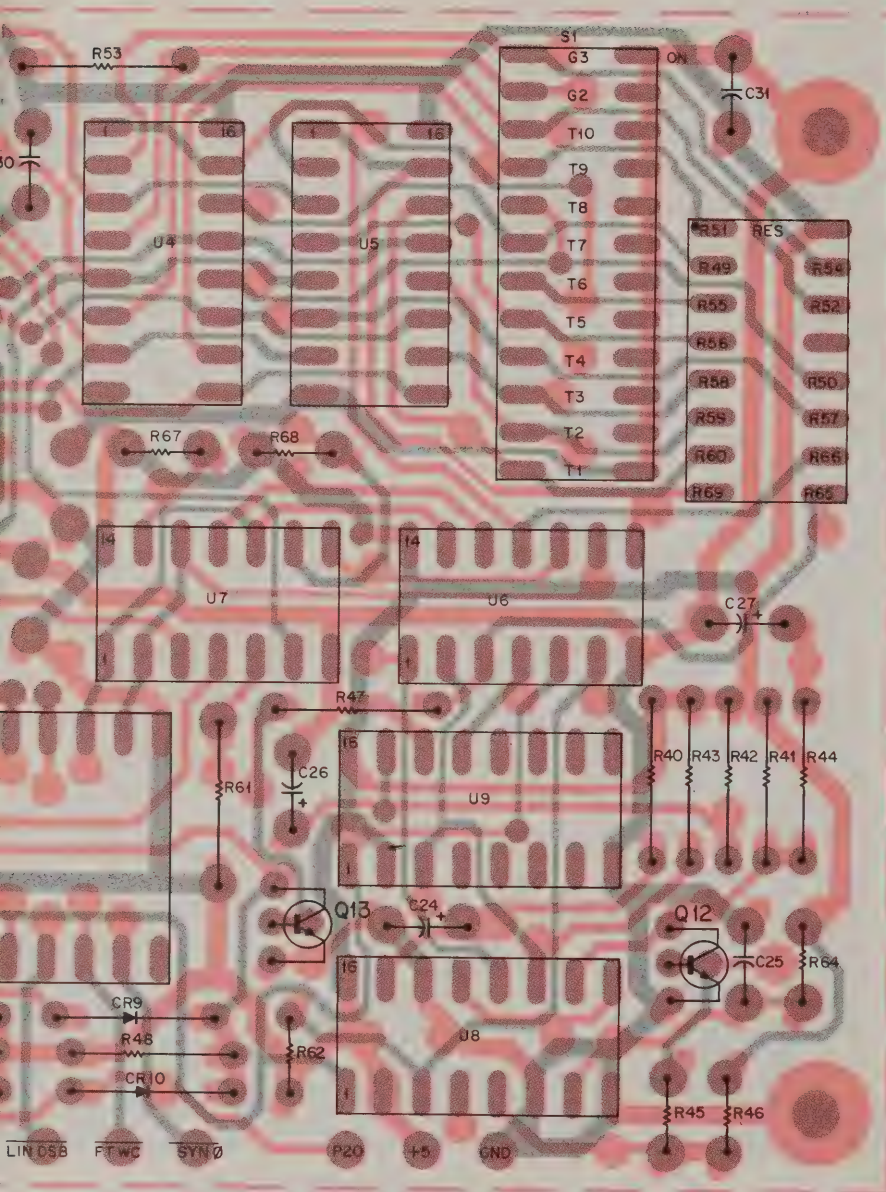
mechanical parts	
2-132616	NUT, 6-32 x 1/4 x 3/32 x 1/8"
3-136194	SCREW, machine: 6-32 x 3/8"
7-84560N01	BRACKET, heat sink mounting
26-84434N01	SHIELD

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE * 80-DEPS-35432-A
SOLDER SIDE 80-DEPS-35433-A
OL-DEPS-35434-B



COMPONENT SIDE BD-DEPS-35435-B
 SOLDER SIDE BD-DEPS-35436-B
 OL-DEPS-35437-B

SIMULCAST CONTROL MODULE

MODEL TLN2559B

FUNCTION

Decodes Function Tone signals and keys the transmitter in response to correct code sequences.

INTEGRATED CIRCUIT
POWER CONNECTIONS

DEVICE	5 VOLTS	9.6 VOLTS	GROUND
U6	14	—	7
U7	14	—	7
U10	—	4	11
U11	—	16	6,7,8

parts list

TRN5625A Control Module Hardware Kit

PL-8319-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-125790	SCREW, machine: 4-40 × 5/16"; 6 used
	45-83914G01	GUIDE, card; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L16	PANEL

EEPS-35431-B

SIMULCAST CONTROL MODULE

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SIMULCAST CONTROL MODULE

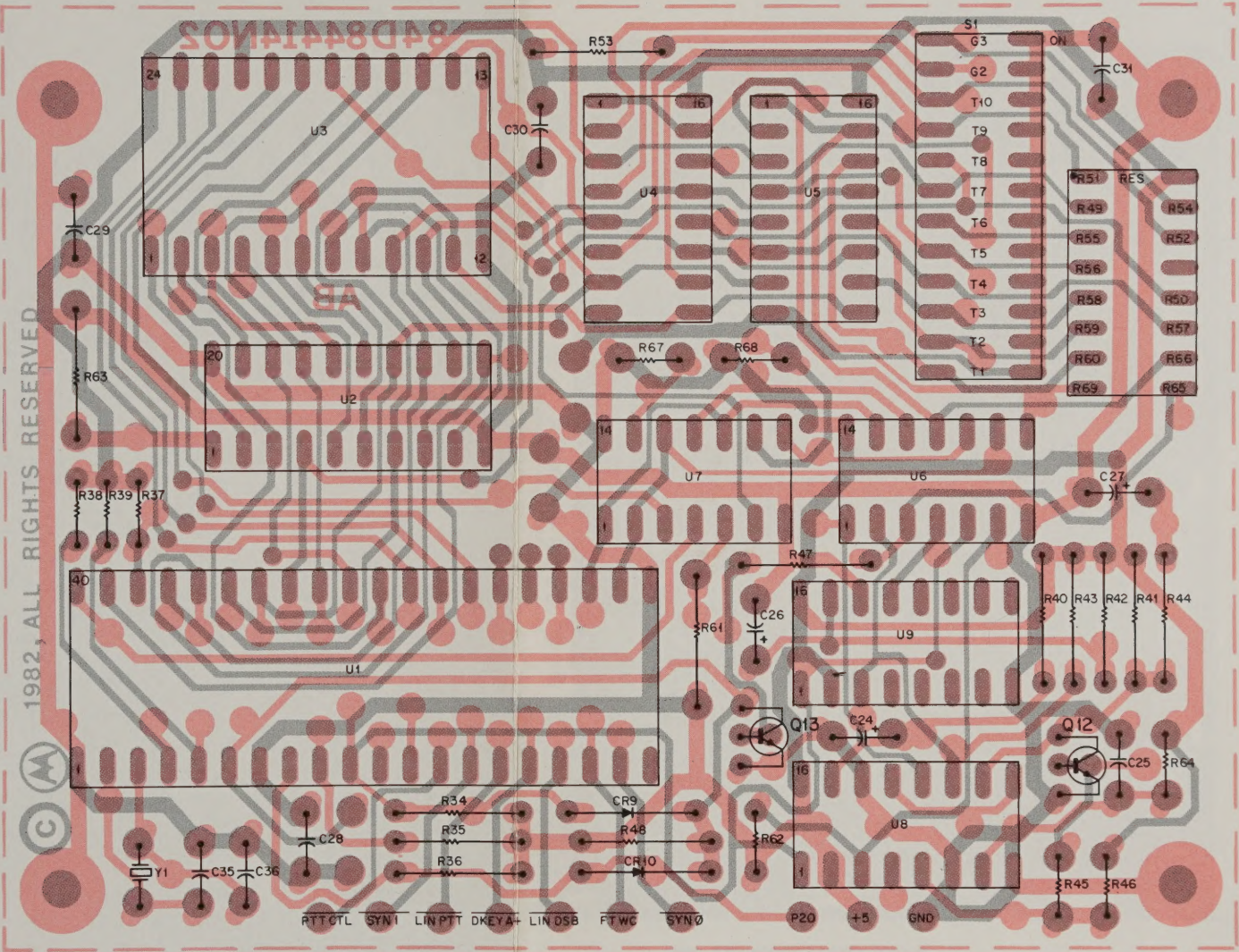
CIRCUIT BOARD DETAIL
TRN5603B LOGIC BOARD

parts list

TRN5603B Logic Board PL-8321-B

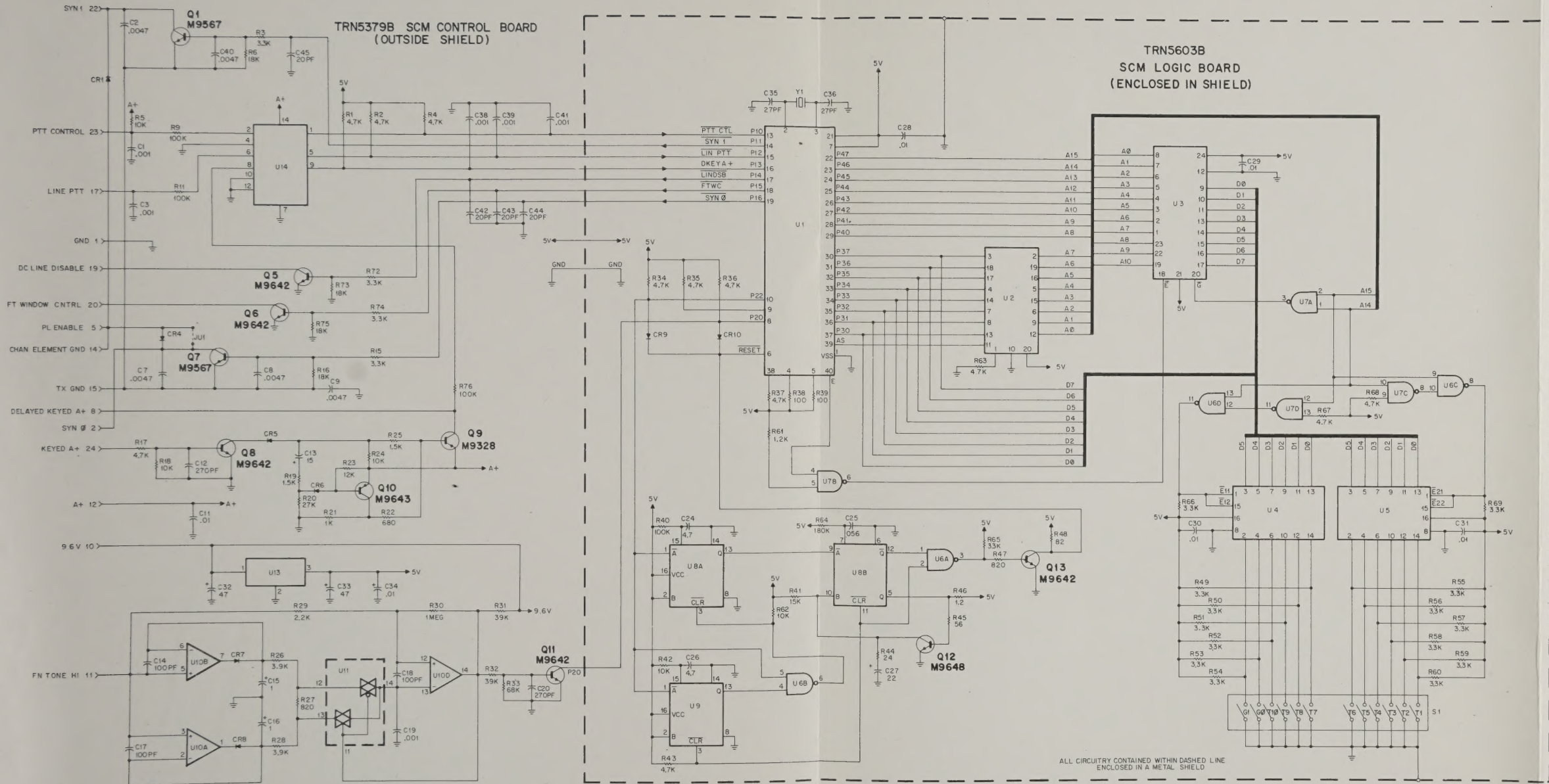
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C24	23-11013D09	capacitor, fixed: 4.7 uF ± 10%; 20 V
C25	8-11017A15	.056 uF ± 5%; 50 V
C26	23-11013D09	4.7 uF ± 10%; 20 V
C27	23-11013C56	22 uF ± 20%; 15 V
C28 thru 31	21-11015A07	.01 uF ± 80 - 20%; 15 V
C35, 36	21-11014H35	27 pF ± 5%; 100 V
CR8, 9	48-82392B03	diode: (see note) silicon
Q12, 13	48-869642	transistor: (see note) NPN; type M9642
R34, 35, 36	6-11009C65	resistor, fixed; ± 5%; 1/4 W; unless otherwise stated
R37	6-11009E65	4.7k
R38, 39	6-11009E25	100
R40	6-11009C97	100k
R41	6-11009C77	15k
R42	6-11009C73	10k
R43	6-11009C65	4.7k
R44	6-11009C10	24
R45	6-11009E19	56
R46	6-11009C51	1.2k
R47	6-11009C47	820
R48	6-11009C23	82
R49 thru 60	p/o 51-84333G23	3.3k resistor network
R61	6-11009C51	1.2k
R62	6-11009E73	10k
R63	6-11009E65	4.7k
R64	6-11009F04	180k
R65A, 66, 69	p/o 51-84333G23	3.3k resistor network
R67, 68	6-11009E65	4.7k
S1	40-83022M04	switch: 12 position; spst
U1	51-83625M06	integrated circuit: (see note) Microprocessor
U2	51-83627M03	Octal Transparent Latch
U3	51-83625M94	ROM
U4, 5	51-84561L77	Hex Buffer, 4-bit and 2-bit (3-state)
U6	51-84371K83	Quad 2-input NAND gate
U7	51-84561L04	Quad 2-input NAND gate
U8, 9	51-84561L11	Monostable Multivibrator
Y1	48-82611M03	crystal: (see note) 3.9672 MHz
mechanical parts		
9-84924E01	SOCKET, 24-contact	
14-84602K02	INSULATOR	
29-82713M01	TERMINAL, lug; 20 used	

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE BD-DEPS-35435-B
SOLDER SIDE BD-DEPS-35436-B
OL-DEPS-35437-B



FUNCTION

Decodes Function Tone signals and keys the transmitter in response to correct code sequences.

